PhD Dissertation

# THE ACQUISITION OF BASQUE AND SPANISH QUANTIFIERS: AN EMPIRICAL STUDY

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"The difficulty is to step aside to
see what language really is.
Once we step aside
we see that language,
even in the hands of a child,
is full of complexities
and surprises".
Yang (2006).
*The infinite gift.*

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Por fin te veo nacer. Después de un tiempo de gestación largo e intenso, sales al mundo real y ves la luz. Esa luz que te ha guiado en tu camino y que ha sido vital para alcanzar tu meta. Esa luz sois vosotras, las personas a las que dedico estos agradecimientos.

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# RESUMEN

Esta tesis se centra en analizar la adquisición y el desarrollo de una serie de cuantificadores por parte de niños vasco- y castellano-parlantes de 4 a 9 años de edad, así como en estudiar la interpretación de los mismos por parte de adultos, a modo de control. Esta investigación se ha llevado a cabo con dos objetivos fundamentales: primero, examinar las implicaturas de escala derivadas de la cuantificación, desde un punto de vista semántico-pragmático; segundo, analizar la interacción entre los cuantificadores universales y la negación, a partir de un análisis sintáctico.

La literatura sobre la adquisición temprana de la cuantificación (Katsos et al. 2012, 2016; Papafragou y Musolino 2003; Noveck 2001; Guasti et al. 2005; e.o.) muestra, por un lado, que los niños adquieren las propiedades semánticas de los cuantificadores de manera gradual (totalidad, parcialidad, proporcionalidad y monotonicidad). Además, se observa que, mientras que los niños de 5 años de edad son capaces de detectar el incumplimiento de los valores de verdad (i.e. oraciones semánticamente correctas e incorrectas), tienen dificultad para rechazar oraciones infra-informativas (pragmáticamente inadecuadas) y derivar, por tanto, la correspondiente implicatura de escala (Grice 1985). Esta dificultad se ha atribuido tradicionalmente a un estadio en el que ciertos recursos pragmáticos no están todavía disponibles para los niños (‘etapa de déficit pragmático’; Noveck 2001). Otras aproximaciones, como la ‘propuesta escalar’ (Barner et al. 2011), sugieren que el conocimiento (o la falta de él) de los ítems escalares en cuestión es lo que determina la habilidad para derivar las implicaturas de escala. Además, otros estudios (Just y Carpenter 1971; Katsos et al. 2012, 2016) han demostrado que los cuantificadores negados suponen un reto para los niños de 5 a 6 años de edad, en comparación con sus equivalentes positivos.

Por otro lado, los estudios sobre la interacción entre los cuantificadores universales y la negación (Musolino 1998; Lidz y Musolino 2002; Musolino y Lidz 2006; Moscati y Gualmini 2008; e.o.) han observado que los niños de 5 a 6 años de edad tienden a basarse en la estructura sintáctica de las oraciones para derivar la correspondiente lectura semántica. Es decir, "La Observación del Isomorfismo" sugiere que a una edad temprana los niños son "isomórficos". Por lo tanto, la posición del operador negativo con respecto al cuantificador universal influye en la interpretación que los niños obtienen de la oración en cuestión.

Cabe destacar que la mayoría de los estudios sobre la adquisición de la cuantificación y, en concreto, sobre la derivación de implicaturas de escala (Noveck 2001, 2004; Guasti et al. 2005; Katsos et al. 2016; e.o.) se han centrado en el desarrollo de niños monolingües. Son escasos los trabajos de investigación sobre este fenómeno con niños bilingües y, además, llegan a conclusiones distintas: (i) los niños bilingües muestran mayores habilidades pragmáticas que los niños monolingües (Siegal et al. 2007); (ii) no hay evidencia sólida a favor de una ventaja bilingüe en lo que a la derivación de implicaturas de escala se refiere (Antoniou et al. 2013; Syrett et al. 2017).

Teniendo en cuenta la literatura previamente mencionada, esta tesis plantea las siguientes hipótesis:

**Hipótesis 1.** Los niños muestran una adquisición gradual de las propiedades semánticas de los cuantificadores (totalidad, parcialidad, proporcinalidad y monotonicidad) (Katsos et al. 2012, 2016).

**Hipótesis 2.** Los niños adquieren las propiedades semánticas de los cuantificadores antes que las propiedades pragmáticas (Noveck 2001, 2004; Katsos et al. 2012, 2016).

**Hipótesis 3.** "La Observación del Isomorfismo" refleja el modo en el que los niños interpretan oraciones con un cuantificador universal y un operador negativo (Musolino 1998; Musolino et al. 2000).

**Hipótesis 4.** No hay una ventaja bilingüe en lo que a la derivación de implicaturas de escala se refiere (Siegal et al. 2007; Antoniou et al. 2013; Syrett et al. 2017).

En base a estas hipótesis y teniendo en cuenta el contexto sociolingüístico del País Vasco, la presente tesis tiene como objetivo responder a las siguientes preguntas de investigación (PI):

**PI1.** ¿Cómo y cuándo adquieren los niños vasco- y castellano-parlantes las propiedades semánticas de los cuantificadores positivos y de los cuantificadores negados (Katsos et al. 2012, 2016)?

**PI2.** ¿Qué factores influyen en la adquisición de las propiedades pragmáticas de los cuantificadores? ¿Se observa una 'etapa de déficit pragmático' (Noveck 2001) o hay una falta de conocimiento de los ítems escalares testados ('propuesta escalar'; Barner et al. 2011)?

**PI3.** ¿Refleja "La Observación del Isomorfismo" el modo en el que los niños vasco- y castellano-parlantes interpretan oraciones con un cuantificador universal y un operador negativo (Musolino 1998; Musolino et al. 2000)?

**PI4.** ¿Hay una ventaja bilingüe en lo que a la derivación de implicaturas de escala se refiere (Siegal et al. 2007; Antoniou et al. 2013; Syrett et al. 2017)?

Con el fin de responder a estas preguntas de investigación, Se han recogido datos de 384 hablantes nativos de euskera y castellano (niños y adultos), divididos en dos estudios distintos: (i) un ESTUDIO PSEUDO-LONGITUDINAL sobre ADQUISICIÓN DE PRIMERAS LENGUAS, en el que han participado 310 niños de 4 a 9 años y adultos vasco- y castellano-parlantes y (ii) un ESTUDIO TRANSVERSAL sobre BILINGÜISMO con 74 niños de 5 a 6 años y adultos vasco- y castellano-parlantes. Se han llevado a cabo dos tareas experimentales: una tarea de evaluación de oraciones (Experimento 1) en dos versiones diferentes y una tarea de selección de imágenes (Experimento 2). Para el estudio sobre aquisición de lenguas maternas, se ha empleado la tarea de evaluación de oraciones en sus dos versiones y la tarea de selección de imágenes y, para el estudio sobre bilingüismo, se ha utilizado la versión 2 de la tarea de evaluación de oraciones.

En la Versión 1 del Experimento 1 se evalúa la comprensión de los cuantificadores que se muestran a continuación:

- Castellano: *todos* 'all', *ninguno* 'none', *algunos* 'some', *la mayoría* 'most', *no todos* 'not all' and *algunos no* 'some not'.
- Euskera: *guztiak* 'all', *bat ere ez* 'none', *batzuk* 'some', *gehienak* 'most', *guztiak ez* 'all not' and *batzuk ez* 'some not'.

En la Versión 2 del Experimento 1 se testa el orden inverso de los cuantificadores universales y el operador negativo: *todos no* 'all not' para el experimento en castellano y *ez guztiak* 'not all' para el de euskera.

En el Experimento 2 se evalúan los dos tipos de órdenes entre los cuantificadores universales y el operador negativo en ambas lenguas.

Tomando como base la literatura previamente mencionada, las hipótesis planteadas y las preguntas de investigación formuladas, estas son las predicciones principales de esta tesis doctoral:

- **PREDICCIÓN 1:** LOS CUANTIFICADORES (Q) SEMÁNTICAMENTE MÁS COMPLEJOS SE ADQUIRIRÁN DE MANERA MÁS TARDÍA:

  - **PREDICCIÓN 1A:** LOS QS PARCIALES SE ADQUIRIRÁN MÁS TARDE QUE LOS QS TOTALES.
  - **PREDICCIÓN 1B:** LOS QS PROPORCIONALES SE ADQUIRIRÁN MÁS TARDE QUE LOS QS PARCIALES.
  - **PREDICCIÓN 1C:** LOS QS MONÓTONOS DECRECIENTES SE ADQUIRIRÁN MÁS TARDE QUE LOS QS MONÓTONOS CRECIENTES.

- **PREDICCIÓN 2:** LOS NIÑOS TENDRÁN MÁS DIFICULTADES PARA DETECTAR VIOLACIONES DE INFORMATIVIDAD QUE VIOLACIONES DE LOS VALORES DE VERDAD.

- **PREDICCIÓN 3:** LOS NIÑOS DERIVARÁN MENOS IMPLICATURAS DE ESCALA QUE LOS ADULTOS.

- **PREDICCIÓN 4:** EL PERFIL LINGÜÍSTICO DE LOS NIÑOS NO AFECTARÁ A LA DERIVACIÓN DE LAS IMPLICATURAS DE ESCALA.

- **PREDICCIÓN 5:** EL ORDEN ENTRE LOS CUANTIFICADORES UNIVERSALES (UNIVQ) Y EL OPERADOR NEGATIVO (NEG) DETERMINARÁ LA INTERPRETACIÓN RESULTANTE.

- **PREDICCIÓN 6:** EL TIPO DE TAREA INFLUIRÁ EN LA INTERPRETACIÓN DE UNIVQ-NEG / NEG-UNIVQ.

Después de recoger, codificar y analizar los datos estadísticamente, estos son los resultados principales de este trabajo de investigación:

**1)** Los niños vasco-parlantes de 4 a 9 años de edad muestran el mismo patrón de desarrollo que los niños castellano-parlantes en lo que a la adquisición de las propiedades semánticas de los cuantificadores se refiere, en concordancia con los resultados obtenidos en más de 30 lenguas (Katsos et al. 2012, 2016).

**2)** La complejidad de las propiedades semánticas, pragmáticas y morfosintácticas de los cuantificadores influye en la derivación de las implicaturas de escala de los mismos.

**3)** El perfil lingüístico (monolingües vs. bilingües) de los niños de 5 a 6 años de edad no influye en la derivación de las implicaturas de escala. Es decir, no se observa una ventaja bilingüe (ni monolingüe).

**4)** La interacción entre los cuantificadores universales y el operador negativo influye en la derivación de las implicaturas de escala por parte de los niños vasco- y castellano-parlantes de 4 a 9 años de edad.

**5)** Los niños de 5 a 6 años de edad no obtienen lecturas isomórficas por defecto al interpretar oraciones con UnivQ-Neg y Neg-UnivQ. Este resultado supone una reformulación de "La Observación del Isomorfismo" (Musolino 1998; Musolino et al. 2000).

**6)** Los niños vasco-parlantes difieren de los niños castellano-parlantes con respecto a la interpretación de oraciones con UnivQ-Neg y Neg-UnivQ.

**7)** El tipo de tarea (evaluación de oraciones vs. selección de imágenes) influye en la interpretación de oraciones con UnivQ-Neg y Neg-UnivQ, tanto con niños como con adultos.

Esta tesis doctoral contribuye, por tanto, a cuatro campos de conocimiento, todos ellos importantes para la Lingüística Aplicada:

**a)** En lo que a la psicolingüística se refiere, esta tesis muestra una imagen sobre el desarrollo de los cuantificadores totales, parciales, proporcionales y monótonos en dos lenguas distintas – euskera y castellano – con niños de 4 a 9 años de edad.

**b)** Con respecto a la fiabilidad metodológica, este trabajo de investigación ha empleado un material experimental previamente testado en más de 30 lenguas (Katsos et al. 2012, 2016), permitiendo una comparación rigurosa entre ellas. Además, el elevado número de participantes, teniendo en cuenta la proporción de edad y el perfil lingüístico, así como el uso de dos tareas experimentales – una tarea de evaluación de oraciones y una tarea de selección de imágenes –, ha fortalecido y enriquecido la fiabilidad metodológica.

**c)** En relación a la lingüística teórica, esta tesis ha examinado las propiedades de abarque en la interacción entre los cuantificadores universales y la negación con niños vasco- y castellano-parlantes de 5 a 6 años de edad y con adultos. En concreto, este trabajo ha investigado la influencia del operador negativo sobre los cuantificadores universales, haciendo una comparación entre las interpretaciones obtenidas por niños y adultos.

**d)** Finalmente, en lo que al bilingüismo respecta y, más específicamente, a la psicolingüística y a la sociolingüística, esta tesis doctoral ofrece una imagen sobre la interpretación de los cuantificadores parciales con niños monolingües de castellano y bilingües (euskera-castellano) dominantes en euskera de 5 a 6 años de edad.

# LABURPENA

Tesi honek zenbatzaileen jabekuntza eta garapena ikertzen du 4-9 urte bitarteko haur euskaldun eta gaztelaniadunekin, eta helduen interpretazioak ere ditu ikergai, kontrol moduan. Lan honek bi helburu nagusi ditu: lehenengo, zenbatzaileekin eratorritako eskala inplikaturak aztertu, ikuspuntu semantiko-pragmatiko batetik; bigarren, zenbatzaile unibertsal eta ezeztapenaren arteko interakzioa ikertu, analisi sintaktiko batean oinarrituz.

Zenbatzaileen jabekuntza goiztiarraren literaturak (Katsos et al. 2012, 2016; Papafragou eta Musolino 2003; Noveck 2001; Guasti et al. 2005) haurrek zenbatzaileen ezaugarri semantikoak (osotasuna, partzialtasuna, proportzionaltasuna eta monotonizitatea) era gradual batean jabetzen dituztela erakusten du. Bestalde, 5 urteko haurrek egia-balioen ez-betetzea antzematen duten arren (i.e. semantikoki zuzenak eta okerrak diren esaldiak), zailtasunak dituzte azpi-informatiboak (pragmatikoki desegokiak) diren esaldiak errefusatu eta beharrezko eskala inplikatura eratortzeko (Grice 1985).

Zailtasun honen arrazoia "pragmatic deficit stage" (Noveck 2001) deitutako aro batean oinarritu izan da, non haurrek hainbat baliabide pragmatiko oraindik eskuragarri ez dituzten. Beste proposamen batzuek, "Scalar Approach" izenekoak (Barner et al. 2011) adibidez, zera iradokitzen du: eskala itemen ezagutzak (edo honen gabeziak) eragiten duela eskala inplikaturak eratortzearen gaitasunean. Gainera, hainbat ikerketek erakutsi dute (Just eta Carpenter 1971; Katsos et al. 2012, 2016) zenbatzaile ezeztatuak 5-6 urte bitarteko haurrentzako erronka bat direla, baliokide positiboekin alderatuz.

Bestalde, zenbatzaile unibertsal eta ezeztapenaren arteko interakzioan oinarritutako lanek ikusi dute (Musolino 1998; Lidz eta Musolino 2002; Musolino eta Lidz 2006; Moscati eta Gualmini 2008) 5-6 urte bitarteko haurrek

esaldien estruktura sintaktikoa ardatz hartzen dutela irakurketa semantikoa eratortzeko. Alegia, "Observation of Isomorphism" deitutako behaketak dio haurrak "isomorfikoak" direla 5-6 urte bitartean.

Aipatzekoa da zenbatzaileen jabekuntza ikertzen duten lanek eta, bereziki, eskala inplikaturak ikertzen dituztenek (Noveck 2001, 2004; Guasti et al. 2005; Katsos et al. 2016), haur elebakarren garapena dutela ikergai. Lan gutxi daude fenomeno hau haur elebidunekin aztertzen dutenak eta, gainera, ondorio desberdinetara iristen dira: (i) haur elebidunek haur elebakarrek baino gaitasun pragmatiko handiagoak erakusten dituzte (Siegal et al. 2007); (ii) ez dago ebidentzia sendorik elebidunek abantaila handiagoak dituztela argudiatzeko, eskala inplikaturen eratortzeari dagokionean (Antoniou et al. 2013; Syrett et al. 2017).

Aurreko literatura kontuan hartuz, tesi honek ondoko hipotesi hauek proposatzen ditu:

1. **hipotesia.** Haurrek zenbatzaileen ezaugarri semantikoak (osotasuna, partzialtasuna, proportzionaltasuna eta monotonizitatea) era gradual batean jabetzen dituzte (Katsos et al. 2012, 2016).

2. **hipotesia.** Haurrek zenbatzaileen ezaugarri semantikoak ezaugarri pragmatikoak baino lehenago jabetzen dituzte (Noveck 2001, 2004; Katsos et al. 2012, 2016).

3. **hipotesia.** Isomorfismoaren behaketak zenbatzaile unibertsala eta ezeztapena duten esaldiak haurrek nola ulertzen dituzten zehazten du (Musolino 1998; Musolino et al. 2000).

4. **hipotesia.** Elebidunek, eskala inplikaturen eratortzeari dagokionean, ez dute abantailarik erakusten (Siegal et al. 2007; Antoniou et al. 2013; Syrett et al. 2017).

Hipotesi hauetan oinarrituz eta Euskal Herriko egoera soziolinguistikoa kontuan hartuz, tesi honen xede nagusia ondoko ikerketa galderak (IG) erantzutea da:

**IG1.** Nola eta noiz jabetzen dituzte haur euskaldun eta gaztelaniadunek zenbatzaile positiboen eta ezeztatutako zenbatzaileen ezaugarri semantikoak (Katsos et al. 2012, 2016)?

**IG2.** Zein faktorek eragiten dute zenbatzaileen ezaugarri pragmatikoen jabekuntzan? "Pragmatic deficit stage" (Noveck 2001) bat ikusten da edo eskala itemen ezagutzaren gabezia behatzen da ("Scalar Approach"; Barner et al. 2011)?

**IG3.** Isomorfismoaren behaketak zehazten al du nola ulertzen dituzten haur euskaldun eta gaztelaniadunek zenbatzaile unibertsala eta ezeztapena duten esaldiak (Musolino 1998; Musolino et al. 2000)?

**IG4.** Elebidunek abantaila handiagoak al dituzte eskala inplikaturak eratortzerakoan (Siegal et al. 2007; Antoniou et al. 2013; Syrett et al. 2017)?

Ikerketa galdera hauek erantzun ahal izateko, 384 partehartzaile euskaldun eta gaztelaniadunen (haur eta helduen) datuak jaso ziren, bi ikerketetan banatu zirenak: (i) IKERKETA PSEUDO-LONGITUDINALA, LEHEN HIZKUNTZEN JABEKUNTZARI buruzkoa, non 310 4-9 urte bitarteko haur eta heldu euskaldun eta gaztelaniadunek parte hartu zuten eta (ii) ZEHARKAKO IKERKETA, ELEBITASUNARI buruzkoa, non 74 5-6 urte bitarteko haur eta heldu euskaldun eta

gaztelaniadunek parte hartu zuten. Bi esperimentu burutu ziren: esaldi juzguen ataza (1. esperimentua) bi bertsio desberdinetan eta irudi hautaketa ataza (2. esperimentua). Lehen hizkuntzen jabekuntzari buruzko ikerketarako, esaldi juzguen ataza bi bertsioetan eta irudi hautaketa ataza erabili dira eta, elebitasunari buruzko ikerketarako, esaldi juzguen atazaren 2. bertsioa erabili da.

1. esperimentuaren 1. bertsioan zenbatzaile hauen ulermena testatzen da:

- Gaztelania: *todos* 'all', *ninguno* 'none', *algunos* 'some', *la mayoría* 'most', *no todos* 'not all' and *algunos no* 'some not'.
- Euskara: *guztiak* 'all', *bat ere ez* 'none', *batzuk* 'some', *gehienak* 'most', *guztiak ez* 'all not' and *batzuk ez* 'some not'.

1. esperimentuaren 2. bertsioan zenbatzaile unibertsal eta ezeztapenaren arteko alderantzizko hurrenkera ikertzen da: *todos no* 'all not' gaztelaniazko esperimentuan eta *ez guztiak* 'not all' euskarazkoan.

2. esperimentuan zenbatzaile unibertsal eta ezeztapenaren arteko bi hurrenkerak testatzen dira bi hizkuntzetan.

Aldez aurretik aipatutako literatura, hipotesiak eta ikerketa galderak aintzat hartuz, ondorengo hauek dira tesi honen aurreikuspen nagusiak:

- **1. AURREIKUSPENA:** SEMANTIKOKI KONPLEXUAGOAK DIREN ZENBATZAILEAK (Q) BERANDUAGO JABETUKO DIRA:

  - **1A AURREIKUSPENA:** Q PARTZIALAK Q OSOAK BAINO BERANDUAGO JABETUKO DIRA.
  - **1B AURREIKUSPENA:** Q PROPORTZIONALAK Q PARTZIALAK BAINO BERANDUAGO JABETUKO DIRA.

- **1C AURREIKUSPENA:** Q MONOTONO BEHERAKORRAK Q MONOTONO GORAKORRAK BAINO BERANDUAGO JABETUKO DIRA.

- **2. AURREIKUSPENA:** HAURREK ZAILTASUN GEHIAGO IZANGO DITUZTE INFORMATIBITATE EZ-BETETZEAK HAUTEMATEKO EGIA-BALIOEN EZ-BETETZEAK HAUTEMATEKO BAINO.

- **3. AURREIKUSPENA:** HAURREK HELDUEK BAINO ESKALA INPLIKATURA GUTXIAGO ERATORRIKO DITUZTE.

- **4. AURREIKUSPENA:** HAURREN PROFIL LINGUISTIKOAK EZ DU ESKALA INPLIKATUREN ERATORTZEAN ERAGINIK IZANGO.

- **5. AURREIKUSPENA:** ZENBATZAILE UNIBERTSAL (UNIVQ) ETA EZEZTAPENAREN (NEG) ARTEKO HURRENKERAK LORTUTAKO INTERPRETAZIOA ZEHAZTUKO DU.

- **6. AURREIKUSPENA:** ATAZA MOTAK UNIVQ-NEG / NEG-UNIVQ ESALDIEN INTERPRETAZIOAN ERAGINGO DU.

Datuak jaso, kodetu eta estatistikoki aztertu eta gero, ondoko hauek dira ikerlan honen funtsezko emaitzak:

**1)** 4-9 urte bitarteko haur euskaldunek haur gaztelaniadunen garapen patroi berdina erakusten dute, zenbatzaileen ezaugarri semantikoen jabekuntzari dagokionean. Emaitza hau 30 hizkuntza baino gehiagotan aurkitu denarekin bat dator (Katsos et al. 2012, 2016).

**2)** Zenbatzaileen ezaugarri semantiko, pragmatiko eta morfosintaktikoen konplexutasunak eskala inplikaturen eratortzean eragiten du.

**3)** 5-6 urte bitarteko haurren profil linguistikoak (elebakarrak vs. elebidunak) ez du eskala inplikaturen eratortzean eragiten. Hau da, ez da abantaila elebiduna (ez elebakarra) antzematen.

**4)** Zenbatzaile unibertsal eta ezeztapenaren arteko interakzioak eskala inplikaturen eratortzean eragiten du 4-9 urte bitarteko haur euskaldun eta gaztelaniadunetan.

**5)** 5-6 urte bitarteko haurrek ez dute irakurketa isomorfikorik automatikoki lortzen, UnivQ-Neg y Neg-UnivQ esaldiak interpretatzerakoan. Emaitza honek Isomorfismoaren behaketa birformulatzea eskatzen du (Musolino 1998; Musolino et al. 2000).

**6)** Haur euskaldunek eta haur gaztelaniadunek UnivQ-Neg y Neg-UnivQ esaldiekin irakurketa desberdinak eratortzen dituzte.

**7)** Ataza motak (esaldien juzgua vs. irudien hautaketa) UnivQ-Neg y Neg-UnivQ esaldien ulermenean eragiten du, bai haur bai helduetan.

Tesi honek, beraz, lau jakintza arlotako ekarpenak ditu, guztiak Hizkuntzalaritza Aplikaturako garrantzizkoak:

**a)** Psikolinguistikari dagokionean, tesi honek zenbatzaile oso, partzial, proportzional eta monotonoen garapenaren irudi bat erakusten du bi hizkuntzetan – euskara eta gaztelania – 4-9 urte bitarteko haurretan.

**b)** Metodologiaren fidagarritasunari dagokionean, ikerlan honek 30 hizkuntza baino gehiagotan testatua izan den material bera erabili du (Katsos et al. 2012, 2016), hizkuntzen arteko konparagarritasunerako egokitasuna bermatuz. Gainera, bildutako partehartzaileen kopuru sendoak, adinkako eta hizkuntzakako proportzioa zainduta, eta bi ataza

moten erabilerak – esaldien juzgua eta irudien hautaketa – fidagarritasun metodologikoa sendotu eta aberastu dute.

**c)** Hizkuntzalaritza teorikoari dagokionean, tesi honek zenbatzaile unibertsal eta ezeztapenaren arteko besarkadura ezaugarriak aztertu ditu 5-6 urte bitarteko haur eta heldu euskaldun eta gaztelaniadunekin. Bereziki, lan honek ezeztapenak zenbatzaile unibertsaletan duen eragina ikertu du, haur eta helduek lortutako irakurketak alderatuz.

**d)** Azkenik, elebitasunari dagokionean eta, bereziki, psikolinguistika eta soziolinguistika esparruei dagokienean, tesi honek zenbatzaile partzialen ulermenaren irudi bat erakusten du 5-6 urte bitarteko haur gaztelaniadun elebakarretan eta euskara nagusi duten haur elebidunetan (euskara-gaztelania).

# LIST OF ABBREVIATIONS AND SYMBOLS

| | |
|---|---|
| Ac | acceptance |
| a.o. | among others |
| AoA | Age of Acquisition |
| B | Basque |
| cf. | confer (‘compare’) |
| DEF | definite |
| DET | determiner |
| e.g. | exempli gratia (‘for example’) |
| et al. | et alii (‘and others’) |
| GQT | Generalized Quantifier Theory |
| i.e. | id est (‘that is’) |
| IND | indefinite |
| L1 | first language |
| L2 | second language |
| n | number |
| Neg | negation |
| p. | page(s) |
| PM | Pragmatic Meaning |
| PST | Picture Selection Task |
| Q | quantifier |
| QP | Quantifier Phrase |
| Re | rejection |
| RQ | Research Question |
| SET | Sentence Evaluation Task |
| SI | Scalar Implicature |
| SM | Semantic Meaning |
| Sp | Spanish |
| SOV | Subject-Object-Verb |

| | |
|---|---|
| SVO | Subject-Verb-Object |
| TR | Target Response |
| TVJT | Truth Value Judgment Task |
| UI | Under-Informative |
| UnivQ | Universal Quantifier |
| V1 | Version 1 |
| V2 | Version 2 |
| 2L1 | early bilingual children |
| * | ungrammatical sentence |
| # | nonsensical sentence |
| ∀ | universal quantifier |
| ∃ | existential quantifier |
| ¬ | negative operator |
| +X | containing a feature X |
| -X | not containing a feature X |
| { | opening of a scale |
| } | closing of a scale |

# LIST OF QUANTIFIERS

| **Basque** | **English** | **Spanish** |
|---|---|---|
| *guztiak* | all | *todos* |
| *batzuk* | some | *algunos* |
| *gehienak* | most | *la mayoría* |
| *bat ere ez* | none | *ninguno* |
| *batzuk ez* | some not | *algunos no* |
| *guztiak ez* | all not | *todos no* |
| *ez guztiak* | not all | *no todos*[1] |

[1] For the reader's convenience, a list of the quantifiers tested in the present dissertation together with their translations in English is given.

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# CHAPTER 1: INTRODUCTION

## 1.1 GOAL OF THE DISSERTATION

The present dissertation analyzes 4-to-9-year-old BASQUE and SPANISH children's ACQUISITION and development and adults' comprehension of quantification and it has two main goals: first, we examine the derivation of Scalar Implicatures (henceforth: SI) created with QUANTIFIERS, from the point of view of their semantic and pragmatic behaviour; second, we analyze the interaction between universal quantifiers and negation, based on a syntactic analysis.

Data from 384 native speakers of Basque and Spanish (children and adults) were collected for the present dissertation, divided into two studies: (i) a PSEUDO-LONGITUDINAL STUDY on FIRST LANGUAGE ACQUISITION (FLA) with 310 Basque and Spanish 4-to-9-year-old children and adults, and (ii) a TRANSVERSAL STUDY on BILINGUALISM with 74 Basque and Spanish 5-to-6-year-old children and adults. Two different experimental tasks have been carried out: a Sentence Evaluation Task (SET) (EXPERIMENT 1) in two distinct versions (Version 1 and Version 2) and a Picture Selection Task (PST) (EXPERIMENT 2). In the FLA study the two versions of the SET and the PST have been conducted and in the Bilingual study Version 2 of the SET has been employed.

The literature on quantification (acquisition and comprehension studies, theories on quantification and works on quantification and negation) has been taken as a guideline in order to interpret the outcome of our experiments. The literature on the early acquisition of quantification (Papafragou and Musolino 2003; Noveck 2001; Guasti et al. 2005; a.o.) has shown that while 5-year-old children do not have difficulties to detect violations of truth-conditions, they do have difficulties to detect violations of informativeness (i.e. pragmatic felicity) and thus to derive the corresponding SI (Grice 1985). This difficulty has been

traditionally attributed to a stage at which some pragmatic resources are not still available to children ('Pragmatic Deficit Stage Approach'; Noveck 2001). Other accounts like the 'Scalar Approach' (see Barner et al. 2011) suggest that the (lack of) knowledge about the scalar item in question is what determines the ability to derive the implicature. Moreover, other studies (Just & Carpenter 1971; Katsos et al. 2016, 2012) have found that negated quantifiers pose a challenge for 5-6-year-old children, as compared to their positive counterparts.

It must be highlighted that most of the studies on the acquisition of quantification and, more specifically, on the derivation of SIs (Noveck 2001, 2004; Guasti et al. 2005; Katsos et al. 2016; a.o.) have focused on monolingual children. There are still few studies that investigate this phenomenon with bilingual children and, moreover, they have drawn different conclusions: (i) bilingual children show enhanced pragmatic abilities as compared to monolingual children (Siegal et al. 2007); (ii) there is no solid evidence in favor of a bilingual advantage as regards the derivation of SIs (Antoniou et al. 2013; Syrett et al. 2017).

Besides, studies on the interaction between universal quantifiers and negation (Musolino 1998; Lidz & Musolino 2002; Musolino & Lidz 2006; Moscati & Gualmini 2008; a.o.) have found that 5-6-year-old children tend to rely on the syntactic information of a given sentence in order to derive the semantic reading, that is, children at this age tend to be 'isomorphic'. Therefore, the position of the negative operator with respect to the universal quantifier affects the interpretation obtained by children at an early age.

## 1.2 THE STUDY

Taking into account the aforementioned literature, this dissertation proposes the following hypotheses:

### 1.2.1 Hypotheses

**HYP1.** Children show a gradual acquisition of the semantic properties of quantifiers (totality, partiality, proportionality, monotonicity) (Katsos et al. 2012, 2016).

**HYP2.** Children acquire the semantic properties of quantifiers before the pragmatic ones (Noveck 2001, 2004; Katsos et al. 2012, 2016).

**HYP3.** The "Observation of Isomorphism" accounts for children's interpretation of sentences containing a universal quantifier and a negative operator (Musolino 1998; Musolino et al. 2000).

**HYP4.** There is no bilingual advantage as regards the derivation of SIs (Siegal et al. 2007; Antoniou et al. 2013; Syrett et al. 2017).

Based on these hypotheses and taking into account the sociolingusitic context of the Basque Country, the present dissertation aims to answer the following research questions (RQ):

### 1.2.2 Research questions

**RQ1.** How and when do Basque and Spanish children acquire the semantic properties of positive and negated quantifiers (Katsos et al. 2012, 2016)?

**RQ2.** Which factors influence on the acquisition of the pragmatic properties of quantifiers? Do we observe 'a pragmatic deficit stage' (Noveck 2001) or is there a lack of knowledge about the scalar items in question ('Scalar Approach'; Barner et al. 2011)?

**RQ3.** Does the "Observation of Isomorphism" (Musolino 1998; Musolino et al. 2000) account for Basque and Spanish children's interpretation of sentences containing a universal quantifier and a negative operator?

**RQ4.** Is there a bilingual advantage as regards the derivation of SIs (Siegal et al. 2007; Antoniou et al. 2013; Syrett et al. 2017)?

### 1.2.3 Participants and experiments

A total of 384 native speakers of Basque and Spanish (children and adults) participated in the present dissertation, divided into two studies:

- **FLA study**: 310 participants were recruited for Versions 1 and 2 of EXPERIMENT 1 and EXPERIMENT 2, where data from participants' L1 were collected. For the FLA study, see Chapters 4, 5 and 6.

- **Bilingual study**: 74 participants were recruited for the study on bilingualism, where data from the participants' two L1s were collected. For the Bilingual study, see Chapter 7.

Two experiments were conducted, EXPERIMENT 1 and EXPERIMENT 2, and EXPERIMENT 1 was carried out in two different versions, Version 1 and Version 2. Both EXPERIMENT 1 and EXPERIMENT 2 are experimental off-line tasks and they measure comprehension oral data. EXPERIMENT 1-Version 1 was conducted in order to test HYP1, HYP2 and HYP4 and to answer RQ1, RQ2 and RQ4, related to the semantics-pragmatics interface. EXPERIMENT 1-Version 2 and EXPERIMENT 2 were conducted in order to test HYP3 and to answer RQ3, related to syntax.

EXPERIMENT 1 is the adaptation to Spanish and to Basque of the linguistic items in the materials from Katsos et al. (2012) and it is a Sentence Evaluation Task (SET).[2] In Version 1 of EXPERIMENT 1 the comprehension of the following quantifiers was tested:

- Spanish: *todos* 'all', *ninguno* 'none', *algunos* 'some', *la mayoría* 'most', *no todos* 'not all' and *algunos no* 'some not'.

- Basque: *guztiak* 'all', *bat ere ez* 'none', *batzuk* 'some', *gehienak* 'most', *guztiak ez* 'all not' and *batzuk ez* 'some not'.

In Version 2 of EXPERIMENT 1 a slight modification of the materials was made and the inverse order of the negated universal quantifiers was tested: *todos no* (UnivQ-Neg) for Spanish and *ez guztiak* (Neg-UnivQ) for Basque.

EXPERIMENT 2 is a Picture Selection Task (PST). In this experiment the interaction between the universal quantifiers *guztiak* for Basque and *todos* for Spanish and the negative operator is investigated, including Neg-UnivQ in Experiment 1 and a modified version (UnivQ-Neg) in EXPERIMENT 2.

### 1.2.4 Predictions

Based on the existing literature, we formulated a series of predictions.[3] Predictions 1 to 3 are related to HYP1 and HYP2 and to RQ1 and RQ2, and will be tested in Chapters 4 and 5. Prediction 4 is related to HYP4 and RQ4, and will be tested in Chapter 7. Finally, Predictions 5 and 6 are related to HYP 3 and RQ3 and will be tested in Chapter 6.

[2] The Basque adaptation was carried out by María José Ezeizabarrena.
[3] The literature on quantification will be described in depth in Chapter 2.

**PREDICTION 1:** SEMANTICALLY MORE COMPLEX QUANTIFIERS (QS) WILL BE ACQUIRED LATER:

- **PREDICTION 1A:** PARTIAL QS WILL BE ACQUIRED LATER THAN TOTAL QS

We expect L1Spanish and L1Basque children to better comprehend the total quantifiers *todos* for Spanish and *guztiak* for Basque − which refer to the totality of the potential reference set − than the partial quantifiers *algunos* for Spanish and *batzuk* for Basque − whose reference set is a portion of the potential reference set, based on previous literature (Hanlon 1988; Katsos et al. 2016; a.o.).

- **PREDICTION 1B:** PROPORTIONAL QS WILL BE ACQUIRED LATER THAN PARTIAL QS.

We expect children to have fewer difficulties comprehending the partial quantifiers *algunos* for Spanish and *batzuk* for Basque, than comprehending the proportional quantifiers *la mayoría* for Spanish and *gehienak* for Basque (see Hackl 2009; Pietroski et al. 2009; Katsos et al. 2016).

- **PREDICTION 1C:** MONOTONE DECREASING QS WILL BE ACQUIRED LATER THAN MONOTONE INCREASING ONES

We expect children's rates of comprehension to be higher with monotone increasing quantifiers (*todos* and *algunos* for Spanish, and *guztiak* and *batzuk* for Basque) than with monotone decreasing ones (*no todos* and *algunos no* for Spanish, and *guztiak ez* and *batzuk ez* for Basque) (see Just & Carpenter 1971; Katsos et al. 2016).

**PREDICTION 2:** CHILDREN WILL HAVE MORE DIFFICULTIES DETECTING VIOLATIONS OF INFORMATIVITY THAN VIOLATIONS OF TRUTH-CONDITIONS

We expect children to have fewer difficulties detecting true/false-and-informative sentences than detecting true-but-under-informative ones, in line with previous literature on early language acquisition (Noveck 2001, 2004; Guasti et al. 2005; Papafragou & Musolino 2003; a.o.).

**PREDICTION 3:** CHILDREN WILL DERIVE FEWER SIS THAN ADULTS

Taking into account that adults show no difficulties in detecting violations of truth-conditions and informativeness (see Guasti et al. 2005; Noveck 2001; Papafragou & Musolino 2003), we predict that Spanish and Basque adults will have no difficulties in detecting neither violations of truth-conditions nor of informativeness. Moreover, based on the fact that children have difficulties to detect violations of informativeness (Noveck 2001, 2004; a.o.), contrary to adults, we expect to find differences between the comprehension pattern of Spanish/Basque adults and the one by Spanish/Basque children in that respect. That is, we predict that children will derive fewer SIs than adults.

**PREDICTION 4:** THE LINGUISTIC PROFILE OF THE CHILDREN WILL NOT AFFECT THE DERIVATION OF SIS

The few studies carried out on the derivation of SIs with bilingual children as compared to monolingual children have given evidence for different results. Siegal et al. (2017) found enhanced pragmatic abilities on behalf of bilingual children, whereas other studies (Antoniou et al. 2013; Syrett et al. 2017) have attested no bilingual advantage. We predict that the linguistic profile of the children will not affect the derivation of SIs, as there is no solid evidence in favour of a bilingual (nor a monolingual) advantage.

**PREDICTION 5:** THE ORDER BETWEEN UNIVQS & NEG WILL DETERMINE THE RESULTING INTERPRETATION

According to the "Observation of Isomorphism" (Musolino 1998; Musolino et al. 2000), "children's semantic scope coincides with overt syntactic scope", thus we predict L1Spanish and L1Basque children to interpret overt Neg-UnivQ as Neg having scope over UnivQ and to interpret overt UnivQ-Neg as UnivQ having scope over Neg.

**PREDICTION 6:** THE KIND OF TASK WILL HAVE AN EFFECT ON THE UNIVQ-NEG / NEG-UNIVQ INTERPRETATION

The methodology employed can influence on the outcome of the experiment (see Featherston 2005; Schmitt & Miller 2010; a.o.), so we expect to find outcome differences between the Sentence Evaluation Task (SET - Version 2 of EXPERIMENT 1) and the Picture Selection Task (PST). While in the SET participants evaluate if they accept or reject a specific reading, in the PST they can express their preference for one reading over the other.

## 1.3 ORGANIZATION OF THE DISSERTATION

This dissertation is organized as follows: Chapter 1 has explained the goal of the dissertation and has presented the study. In Chapter 2, (i) the main semantic, pragmatic and morphosyntactic properties of quantifiers are presented, (ii) the theoretical framework is described and the most relevant studies on the acquisition of quantification are detailed. In Chapter 3, the experimental design, the distinct tasks and the participants are presented. In Chapter 4, (i) the results obtained with positive quantifiers in the FLA study are plotted (as regards the derivation of SIs), and (ii) HYP1 and HYP2, RQ1 and RQ2, and Predictions 1 to 3 are tested. In Chapter 5, (i) the results obtained with negated quantifiers in the FLA study are presented (in relation to SIs), and (ii) HYP1 and HYP2, RQ1 and RQ2, and Predictions 1 to 3 are tested. In Chapter 6, (i) the results obtained in the experiments dealing with the interaction between universal quantifiers and

negation in the FLA study are described, and (ii) HYP 3, RQ3 and Predictions 5 and 6 are tested. In Chapter 7, (i) the Bilingual study is presented, and (ii) HYP4, RQ4 and Prediction 4 are tested. Finally, Chapter 8 (i) presents the main contributions of the present dissertation, (ii) provides a general discussion for the formulated predictions and research questions, (iii) summarizes the final conclusions and (iv) opens new lines for further research.

# CHAPTER 2: MAIN PROPERTIES OF QUANTIFIERS, THEORETICAL FRAMEWORK AND EMPIRICAL RESEARCH

In this chapter (i) the main semantic and pragmatic properties of quantifiers will be described and (ii) the results obtained with children and adults in empirical studies will be presented.

As the number and classification of quantifiers is distinct from one language to another, in this work the properties of the most widely studied quantifiers will be presented, which are indeed the most frequent in early child data, i.e. *some*, *most*, *all*, together with their negated counterparts.

## 2.1 THE SEMANTICS-PRAGMATICS INTERFACE

Quantifiers are complex linguistic units which have special and unique semantic-pragmatic and morphosyntactic properties, thus enabling researchers to work on different language areas.

Saeed (2016; p. 451) defines quantifiers as "expressions that indicate a quantity of something, though usually distinguished from enumerating by numerals. Quantifiers may constitute a special class of determiners like English *all*, *every*, *no*, *most*, *many*, etc., or in other languages belong to other grammatical categories such as adjectives. In predicate logic there are two quantifiers: the universal and existential quantifiers".

Universal and existential quantifiers are first-order quantifiers represented in predicate logic with the symbols ∀ and ∃, respectively. Universal quantifiers like *every* and *all* express that the formula following them is true of all entities in

a domain. Besides, existential quantifiers like *some* denote that the formula following them is true of at least one entity in a domain.

There are quantifiers, however, which are not definable based on first-order logic, as they cannot be expressed by semantic propositions containing ∀ or ∃. This is the case of proportional quantifiers like *most*, whose meaning is obtained based on the relation between the cardinalities of two sets, that is, the number of elements in a set in proportion to (as compared to) the number of elements of another (bigger) set.

In fact, the meaning of quantifiers (as that of number words) has been traditionally taken to correspond to SET-theoretical logical concepts within Generalized Quantifier Theory (GQT) (see Barwise & Cooper 1981). Quantifiers are employed to assert that (*all* / *most* / *some* / *none* of) the members of a set have some property. What distinguishes quantifiers from number words is that the latter (but not the former) denote specific cardinalities of sets (*one* / *three* / *ten* / etc.).

In this section the main semantic (2.1.1) and pragmatic properties (2.1.2) of quantifiers are described, an overview of the main theories on implicatures is given (2.1.3) and the most important studies on quantification with children and adults are detailed (2.1.4).

### 2.1.1 Semantic properties

There are several semantic features that natural quantifiers may have: totality / partiality, proportionality, monotonicity, scalarity and informativeness (Saeed 2016).

#### 2.1.1.1 Totality / partiality

There are quantifiers that refer to the TOTALITY of the potential reference set (i.e. the possible reference group in the real world), like the quantifier *all*, whose actual reference set is identical to the potential reference set (Hanlon 1988), whereas other quantifiers refer to a PARTIALITY of the potential reference set, like *some*, whose actual reference set is an indefinite portion of the potential reference set. For instance, while (1a) denotes that the total number of students attended the lecture (actual reference set 'all the students' = potential reference set 'all the students'), (1b) denotes that only a part of the total number of students attended the lecture (actual reference set 'some students' ≠ potential reference set 'all the students').

(1) a. All the students attended the lecture.
b. Some students attended the lecture.

#### 2.1.1.2 Proportionality

There are quantifiers, however, which are semantically more complex than other ones: proportional quantifiers like *most*. For example, while both *some* and *most* refer to an underspecified subset of the potential set, *most* poses an additional semantic difficulty, i.e. it refers to a quantity which is 'more than half' (see Pietroski et al. 2009; Solt 2016; a.o.). Indeed, the meaning of 'most' is obtained based on the relation between the cardinalities of two sets, rather than in terms of a relation between the individual elements of those sets (i.e. one-to-one readings).

So while a sentence like (2) means that 'the number of yellow dots is greater than the number of nonyellow dots', a sentence like (3) means that 'some dots have the characteristic of being yellow'.

(2) Most of the dots are yellow.

(3) Some dots are yellow.

According to Partee (1988), *some* can get both a partitive and a non-partitive reading. Thus (3) could be ambiguous between these two readings: (i) a partitive reading like "some OF the dots are yellow" and (ii) a non-partitive (generic) reading like "there are some dots that are yellow".

Hackl (2009) argues that 'most' should be interpreted as the superlative of 'many', after conducting various verification strategies for distinguishing 'most' from 'more than half'. He finds indeed that 'most' is subject to the same licensing conditions that govern the interpretation of superlatives in general.

2.1.1.3 Monotonicity

Another characteristic that quantifiers share relates to MONOTONICITY and the fact that quantifiers can be either MONOTONE INCREASING or MONOTONE DECREASING. Quantifiers that guarantee inferences from sets to supersets are known as monotone increasing; so if (4a) is true, then the truth of (4b) is also guaranteed. On the other hand, quantifiers that guarantee inferences from sets to subsets are monotone decreasing; thus, if (5a) is true, then the truth of (5b) is also guaranteed. And most importantly, in both (4) and (5) the inference holds in only one direction. In (4), with monotone increasing quantifiers, the inference has an upward direction, while in (5), with monotone decreasing quantifiers, the direction of the inference is reversed, being downwards.

(4) a. All/some/most of the students are playing football. (SET)

b. All/some/most of the students are playing a sport. (SUPERSET)

(5) a. None of the students are playing sport. (SET)

b. None of the students are playing football. (SUBSET)

2.1.1.4 Scalarity and informativeness

One of the most important characteristics of quantifiers is that they are ordered in natural scales. It is worth mentioning that not only quantifiers are ordered in natural scales, e.g. *colors* {black, grey, white}, *temperature* {hot, mild, cold}, *family hierarchies* {grandmother, mother, daughter}, etc. In fact, only elements that respond to a gradation can be ordered in a scale; they are ordered according to their strength. The concept of strength varies from one scale to another: strength will be related to intensity for colors (the more intense the stronger and the less intense the weaker), to higher grades for temperature (the more grades the stronger and the fewer grades the weaker) and to age for family hierarchies (the older the stronger and the younger the weaker).

In the case of quantifiers (Horn 1972), the concept of strength is related to QUANTITY and INFORMATIVENESS: the greater quantity denoted by the quantifier, the more informative the term, and thus, the stronger; the less quantity denoted by the quantifier, the less informative the term, and thus, the weaker. In (6) there is a representation for the scale formed by two quantifiers, *all* and *some*. *All* is stronger than *some*, since it denotes a greater quantity and it is more informative, as the quantity denoted by *all* is more precise than that denoted by *some*.

(6) {all, some}

The semantic features of a quantifier (i.e. if it is monotone increasing or decreasing, if it is strong or weak…) will determine its SEMANTIC MEANING, which will be the basic lexical meaning of the quantifier in question.

### 2.1.2 Pragmatic properties

Apart from the semantic characteristics described so far, there are various pragmatic properties that natural quantifiers share as well: implicature and entailment.

#### 2.1.2.1 Implicature

SCALAR IMPLICATURES (SI), also known as pragmatic/scalar inferences, are extra-logical meanings (i.e. PRAGMATIC MEANINGS) derived by a pragmatic enrichment to the semantic meaning of the term in question (see Noveck 2004). A SI is a specific type of generalized conversational implicature and it is derived when the hearer infers that the speaker had a reason for not using a more informative or stronger term from the scale. In fact, the choice of the weaker term suggests that none of the stronger terms in the scale hold.

The use of a weak item from the scale IMPLICATES (Grice 1975, 1989) that a stronger item does not hold. In (7) (repeated from (6)), the use of the quantifier *some* implicates that the stronger quantifier *all* does not hold. In other words, uttering a sentence like (8) implicates that the stronger alternative in (9) does not hold.

(7) {all, some}

(8) Some students attended the talk.

(9) All the students attended the talk.

#### 2.1.2.2 Entailment

In these natural scales, there is an ENTAILMENT relationship between the quantifiers. ENTAILMENT is understood as a relation between elements / constituents / sentences, where the truth of one guarantees the truth of the other (Saeed 2016).

In quantification, the strong quantifiers from the scale entail the weak ones, but not the other way around. In (7), *all* entails *some*, since if (9) is true, then (8) must also be true; however, *some* does not entail *all*, since the truth of (8) does not guarantee the truth of (9).

### 2.1.3 Theories on implicatures

Conversational implicatures have been (and are) one of the major topics in the pragmatics field. Grice (1975, 1989) was the first (i) to introduce the term IMPLICATURE, (ii) to make a detailed classification of implicatures and (iii) to develop such a widespread and influential theory of conversational implicatures.

#### 2.1.3.1 Grice's Theory of Implicature

Grice (1975, 1989) was the first to distinguish between *what is said* by a sentence and *what is meant* by uttering it. While the former refers to the conventional (semantic) meaning of the sentence, the latter refers to what is (pragmatically) implicated by uttering that sentence.

Grice differentiates between two types of implicatures: CONVENTIONAL and CONVERSATIONAL implicatures. A conventional implicature is part of a lexical item's or expression's agreed meaning, rather than derived from principles of language use. But a conventional implicature happens when the conventional meaning of words used determine what is implicated. For instance, a sentence like (10) for an English citizen implicates "that his being brave is a consequence of his being an Englishman". The generated implicature is based on the conventional meaning of the words used in uttering that sentence.

(10) He is an Englishman; he is, therefore, brave. (Grice 1975: 44)

A conversational implicature is derived on the basis of conversational principles and assumptions, relying on more than the linguistic meaning of words in a sentence. In the conversational exchange in (11), speaker A (conversationally) implicates "that she needs a place to buy petrol". Speaker B (conversationally) implicates that "the garage is open and sells petrol". However, due to the CANCELABILITY PROPERTY of conversational implicatures, the former implicature in (11A) can be cancelled if speaker A utters (11B') (Grice 1975: 51).

(11) A: I am out of petrol.
B: There is a garage around the corner.
B': I am out of petrol, but I do not need to use the car any more.

Grice also distinguishes between PARTICULARIZED and GENERALIZED CONVERSATIONAL implicatures. Grice states that a particularized conversational implicature, such as (11), is derivable (i.e. generated) only in a specific context, in which a special knowledge is required, that only the participants of the conversation understand. A generalized conversational implicature, by contrast, is derived on the basis of conversational principles and assumptions, relying on more (e.g. cultural clues) than the linguistic meaning of the words in a sentence.

A specific type of generalized conversational implicatures is the SCALAR IMPLICATURE (SI). A SI is an implicature derived when the hearer infers that the speaker had a reason for not using a more informative or stronger term of the scale. The choice of the weaker term suggests that none of the stronger terms in the scale hold. Sentence (12) implies that "John did not eat all of the cake". Thus, the choice of the weaker term *some* from the scale {all, some} suggests that the stronger term *all* in the scale does not hold for this situation.

(12) John ate some of the cake.

Deriving a SI means understanding that the speaker had a reason for not using a more informative (i.e. stronger) term from the scale, that is, believing that the speaker was trying to convey a specific meaning as well as being cooperative with the listener. According to Grice (1975), the participants in a conversational exchange tend to be cooperative with one another, in order to make the communication successful. He labels this cooperative effort as "The Cooperative Principle", defined in (13):

(13) The Cooperative Principle

> "Make your contribution such as required, at the stage at which it occurs, by the accepted purpose or direction of the talk exchange in which you are engaged" (Grice 1975: 45)

Under this general principle, Grice distinguishes between four different maxims (with their submaxims), which participants should obey, so as to make the conversation meaningful. These maxims can be observed in (14):

(14) Grice's Maxims (1975: 45-46):

- QUANTITY
- Make your contribution as informative as is required (for the current purposes of the exchange).
- Do not make your contribution more informative than is required.

- QUALITY
- Try to make your contribution one that is true.
- Do not say what you believe to be false.
- Do not say that for which you lack adequate evidence.

- RELATION
- Be relevant.

- MANNER

- Be perspicuous.
- Avoid obscurity of expression.
- Avoid ambiguity.
- Be brief (avoid unnecessary prolixity).
- Be orderly.

The Cooperative Principle (together with its four maxims) plays a role in generating conversational implicatures. At every stage of a conversation, a participant should make his contribution sufficiently informative, true, relevant and clear. Flouting one of these maxims is what gives rise to a conversational implicature.

Though Grice's Theory of Implicature is well-known and widely accepted, it has been reanalyzed, mainly because of two reasons: (i) Grice's Theory does not provide enough detail about the actual derivation and the processing cost of implicatures by adults; (ii) experimentally testable hypotheses are needed. It is exactly with this aim that pragmatic alternative accounts such as *The Default Inference View* by Neo-Griceans (Horn 1973; Levinson 1983, 2000) and *Relevance Theory* (Sperber & Wilson 1995[1986]) were proposed.

#### 2.1.3.2 The Default Inference View - Neo-Griceans

*The Default Inference View* by Neo-Griceans (see Horn 1973; Levinson 1983, 2000) states that SIs are a specific type of generalized conversational implicatures (following Grice 1975), which lead to default pragmatic inferences. They distinguish three different levels of meaning:

(i) the sentence-type meaning (similar to the Gricean concept of *what is said* by a sentence),

(ii) the utterance-token meaning (the full interpretation of a linguistic act), and

(iii) the utterance-type meaning (the level of generalized conversational implicatures).

Neo-Griceans argue that when having to interpret a given sentence, adults resort to pragmatics and derive a SI by default, and that, afterwards, if it is required by the context, the previous pragmatic inference can be cancelled. For instance, in the conversational exchange in (15) (repeated from (11)), speaker A's implicature "that she needs a place to buy petrol" can be cancelled if speaker A utters, for instance, "I am out of petrol, but I do not need to use the car any more".

(15) A: I am out of petrol.
B: There is a garage around the corner. (Grice 1975: 51)

Moreover, according to defaultism, a high cognitive load in experimental tasks (e.g. the introduction of a dual task) will lead to more pragmatic responses (i.e. to a higher derivation of SIs) than a low cognitive load (i.e. a single task).

Thus, the contribution of Neo-Griceans to Grice's Theory is twofold: (i) they put forward the idea that implicatures are derived by default and (ii) they provide a hypothesis which is experimentally testable.

2.1.3.3 Relevance Theory

*Relevance Theory* explains that human cognition tends to select and process inputs which are relevant and beneficial for the functioning of the cognitive system, as well as minimizing the processing costs. That is, the participants in a conversation try to make a balance between the effort and the

effect (i.e. the resulting production) by minimizing the expenditure (the processing cost) and at the same time maximizing the gain (the cognitive effect).

Sperber & Wilson (1995: 260) define two Principles of Relevance:

(16) The Cognitive Principle: human cognition is geared to the maximization of relevance.
(17) The Communicative Principle: utterances create expectations of optimal relevance.

Sperber & Wilson (1995), contrary to Neo-Griceans, argue that SIs follow the same rules as particularized conversational implicatures. Therefore, in order to interpret a sentence, adults first rely on the semantic meaning of the sentence in question, and if semantics provides us with a satisfactory interpretation, it is not necessary to resort to pragmatics and derive a SI, since that enrichment of the meaning would imply an additional and unnecessary processing cost or expenditure.

Therefore, the contribution of *Relevance Theory* to Grice's Theory is also twofold: (i) they argue that implicatures are only derived if the context requires them and (ii) they also provide a hypothesis which is experimentally testable.

Both *The Default Inference View* and *Relevance Theory* are theoretical accounts for the sentence meaning and the derivation of (conversational) implicatures, which try to refine Grice's ideas and provide experimentally testable hypotheses. The main question is which theoretical account seems to be more accurate when analyzing empirical adult data.

In this section, we have described the main theories on pragmatic implicatures. With the purpose of knowing (i) how adults actually process SIs,

and (i) how and when children start deriving SIs, different processing and comprehension studies have been conducted (see sections 2.1.4.1 and 2.1.4.2).

### 2.1.4 Empirical research

2.1.4.1 Studies on quantification with adults

A range of offline and online studies/processing studies have been conducted, in order to know if adult speakers derive SIs by default (*Default Theory*; see Horn 1973, and Levinson 1983, 2000) or not (*Relevance Theory*; see Sperber & Wilson 1995[1986]).

Noveck and Posada (2003) conducted an Evoked Potentials Study with 19 adult speakers of French who were confronted with sentences like (18), which is semantically true (19), but pragmatically infelicitous, since it is under-informative; indeed, based on real world knowledge, we know that "all elephants have trunks", thus uttering *some* instead of *all* is not informative enough.

(18) Some elephants have trunks.
(19) Some and maybe all elephants have trunks.

Participants were asked to evaluate the truth or falsity of sentences like (18) and their reaction times were measured. Answering 'false' (that is, rejecting the sentence) implies deriving the SI that 'some, but not all the elephants have trunks', which is false faced to real world knowledge; answering 'true' (that is, accepting the sentence) means not deriving such a SI. Results showed that the participants who responded 'false' to those utterances took longer than those who responded 'true', which indicates that SIs are not derived by default and require an additional processing cost, in line with Sperber & Wilson 1995[1986].

Noveck (2004) also discovered that reaction times were longer when adults rejected under-informative sentences like (18) and derived a SI (3360ms.)

than when they did not (2617ms.), what again suggests that even for adults resorting to pragmatics and deriving a SI implies an additional processing cost.

Bott and Noveck (2004) found that the number of participants who rejected under-informative sentences (and thus derived a SI) increased when longer response times were allowed, what led them to conclude that SIs are not derived by default and require an additional processing cost.

Dieussaert et al. (2011) conducted an experiment with an increased cognitive load (through the introduction of a dual task), in order to see if more SIs with *some* were generated (in line with Neo-Griceans' "default view"), or if fewer were generated (in line with Relevance Theory). Results showed that adults generated fewer SIs under high cognitive load, favoring this way the contextualist account.

In order to have a more specific knowledge about the actual processing of SIs, Breheny et al. (2006) conducted a self-paced reading task to see if adults derived SIs by default in neutral contexts (i.e. contexts which do not favor the derivation of a SI, that is, contexts without a scalar term). Longer reading times were measured when the segment containing the scalar word was preceded by a context which favored a pragmatically enriched reading (a SI), rather than by a context which favored a literal reading. They found that (i) SIs were only generated when supported by conversational information, and that (ii) they required a greater processing cost.

Huang and Snedeker (2009) conducted an eye-tracking experiment, so as to see if adult speakers could disambiguate a referent which contained a SI (like (20)) out of four images displayed on a screen.

(20) Point to the girl with some/all/two/three of the socks.

They found that adult speakers obtained the correct interpretation of all the quantifiers before the disambiguation point, but a delay was observed with the quantifier 'some', which was related to an extra processing cost of deriving a SI.

In sum, the studies on quantification with adults go in line with Relevance Theory, as adults' derivation of SIs relies on the context in question and implies a processing cost.

#### 2.1.4.2 Studies on quantification with children

##### 2.1.4.2.1 Semantics

Hanlon (1988) found out that quantifiers that refer to the totality of the potential reference set were earlier acquired over quantifiers whose reference set is a portion of the potential reference set. Thus, a quantifier like *all* ─ "whose actual reference set is identical to the potential reference set" ─ appeared earlier (comparing 3-to-7-year-old children) in acquisition than a quantifier like *some* ─ "whose actual reference set is an indefinite portion of the potential reference set" ─ (Hanlon 1988:69).

With the aim of observing which quantifiers are acquired earlier, she analyzed comprehension and production data from different children. As for the production data, she analyzed the data from Roger Brown's (1973) longitudinal study of Adam, Eve and Sarah. As for the comprehension data, she tested 75 3-to-7-year-old children, as well as 10 adults. Specifically, the quantifiers *all*, *no/none*, *some*, *any*, *another*, *(the) other*, *each*, *every*, *both*, *either* and *neither* were tested.

For the production data, "the criterion for the point of emergence for each quantifier was the time at which the form had occurred in three different phrase contexts across samples" (Hanlon 1988, p. 71). For the comprehension data, children carried out two different tasks: the *Cookies* task and the *Letters* task. In

the *Cookies* task, children were told to "Give him (the Cookie Monster) [*all*, *no/none*, *some*, *any*, *another*, *(the) other*, *each*, *every*, *both*, *either* and *neither*] of the cookies". In the *Letters* task, children had to deliver letters in a series of postboxes.

The results from both the production and the comprehension data from both tasks showed that quantifiers like *all* and *both* appeared earlier (comparing 3-to-7-year-old children), fact from which Hanlon (1988) concluded that quantifiers that refer to the totality of the potential reference set appear earlier in acquisition than quantifiers whose reference set is a portion of the potential reference set.

Just & Carpenter (1971) discovered that children's rates of comprehension were higher with positive quantifiers than with negative ones in a Sentence Evaluation Task. More specifically, they analyzed the processing of three types of affirmative and negative quantifiers. Children were asked to evaluate affirmative and negative utterances about the color of (a subset of) dots with respect to a display of 16 colored dots. Just & Carpenter (1971) found:

(i) That explicit syntactic negatives like *none* and implicit syntactic negatives like *few* were processed differently from semantic negatives like *a minority* (i.e. which were referentially equivalent to *few*).[4]

(ii) All three types of negatives (i.e. explicit syntactic negatives like *none*, implicit syntactic negatives like *few* and semantic negatives like *a minority*) took longer to verify than affirmatives.

[4] Wason (1972) claims that "the conceptual status of semantic negatives seems a little arbitrary, and certainly referential equivalence *per se* is not a satisfactory criterion. It would make the sentence, *The door is open*, a semantic negative because it is referentially equivalent to the syntactic negative, *The door isn't closed*" (p. 27-28).

In fact, they argue that this may be due to the fact that negation is a linguistically and psycholinguistically marked function and, thus, more complex to be acquired (Orenes et al. 2014; Papeo & de Vega 2019).

Katsos et al. (2016[2012]) conducted a Sentence Evaluation Task (SET) with 768 5-year-old children and 536 adults, focusing on quantifying words like *all*, *none*, *some*, *some…not*, and *most* in 31 languages, representing 11 language types. They found a similar order in the acquisition of quantifiers crosslinguistically, in relation to four different factors:[5]

First, children are more successful at comprehending monotone increasing quantifiers as compared to monotone decreasing quantifiers. Children show greater competence with *all* compared to *none* and with *some* compared to *some…not*.

Second, children are more successful at acquiring quantifiers that refer to all or none of the members of a set than they are at acquiring those that refer to only a part of the set. They show greater competence with total quantifiers *all* and *none* as compared to partial quantifiers *some* and *some…not*.

Third, children are more successful at comprehending semantically less complex quantifiers like *some* as compared to *most*.[6]

And fourth, children are more sensitive to violations of truth than to violations of pragmatic felicity or informativeness. That is, children do not reject

[5] Katsos et al. (2016[2012]) found that specific factors, such as negative concord and gender, are significant predictors of crosslinguistic variation.

[6] Katsos et al. (2016[2012]) argue that in order to comprehend "most of the As are Bs," children must compare the cardinalities of the set of As that are Bs with those of the set of As that are not Bs. "Some As are Bs" is simpler, because in this case, children do not have to restrict the quantifier to a specific set of entities or compare cardinalities. They can simply treat "some students like football" as logically equivalent to "there is at least one entity that is both a student and likes football" (i.e. having an existential reading).

sentences that are underinformative (e.g., saying *some* when *all* is true) to the same extent as sentences that violate truth (e.g., saying *some* when *none* is true) or to the same extent as adults do. Children, in fact, more often reject a false statement with *some*, *some…not*, and *most* than an underinformative sentence. This last point, which is related to the derivation of SIs and, more specifically, to the pragmatic level of quantification, will be treated in more depth in the next section.

2.1.4.2.2 Pragmatics

2.1.4.2.2.1 Pragmatic Deficit Stage Approach

A sentence like (21a), uttered in a context where "*all* the students attended the talk" is semantically true (i.e. the truth-conditions are satisfied), but pragmatically infelicitous and UNDER-INFORMATIVE. That is, the use of the weak quantifier *some* from the scale {all, some} is under-informative in a context in which the stronger quantifier *all* holds, and *all* should be employed (following the "Cooperative Principle" (Grice 1975, 1989), and, more specifically, following the first sub-maxim of the "Quantity Principle", which states that a sentence has to be as informative as possible). Thus, when exposed to a construction like (21a) in a experimental setting in which the instruction is to decide whether (21a) matches a picture representing a context where "*all* students attended the talk", the participants can react in two possible ways: (i) they can accept the sentence (thus deriving a 'some, and possibly all' semantic interpretation), or they can reject the sentence, following pragmatics, and thus deriving the SI in (21b).

(21) a. Some students attended the talk.
b. Not all the students attended the talk.

What Noveck (2001) discovered is that L1French children, in contrast to adults, tend to accept pragmatically infelicitous and under-informative

quantificational constructions. Noveck (2001), in fact, carries out an experiment (based on Smith 1980) in which he analyses the comprehension of the quantifiers *tous* 'all' and *certains* 'some' with 7/8-year-old children, with 10/11-year-old children and with adults (the three groups being native speakers of French). The quantifier *tous* 'all' is presented in three types of utterances: (i) absurd (false) utterances like (22a), (ii) appropriate (true) utterances like (22b) and (iii) inappropriate (false) utterances like (22c).

(22) a. All chairs tell time.
b. All elephants have trunks.
c. All dogs have spots.

The quantifier *certains* 'some' is also presented in three types of utterances: (i) absurd (false) utterances like (23a), (ii) appropriate (true) utterances like (23b) and (iii) inappropriate (true though pragmatically infelicitous) utterances like (23c).

(23) a. Some stores are made of bubbles.
b. Some birds live in cages.
c. Some giraffes have long necks.

What Noveck (2001) finds out is the following: the 95% of the 7/8-year-old children and the 99% of the 10/11-year-old children reject a sentence such as (23a), the 84% of the 7/8-year-old children and the 90% of the 10/11-year-old children accept a sentence such as (23b), and the 89% of the 7/8-year-old children and the 95% of the 10/11-year-old children accept a sentence such as (23c). In contrast, while the 98% of adults reject a sentence like (23a) and the 99% of adults accept a sentence like (23b), only the 41% of the adults accept a sentence like (23c), suggesting that adults tend to reject pragmatically infelicitous sentences, contrary to children. These results lead Noveck (2001) to conclude that the acquisition of quantifiers is a semantics-to-pragmatics developmental

phenomenon; children firstly rely on semantics to comprehend quantifiers, and once the semantic meaning is established, they can start making use of pragmatic resources.

In sum, "The Pragmatic Deficit Stage Approach" (see Noveck 2001) assumes that children's difficulty to derive SIs is due to a lack of pragmatic resources at an early age. There are other studies, like the "Scalar Approach" (also known as the "Alternative-based Approach") by Barner et al. (2011) (see section 2.1.4.2.2.2), which gives a different analysis so as to explain the difficulty to derive SIs in the early childhood.

2.1.4.2.2.2 Scalar Approach

Barner et al. (2011) claim that the pragmatic difficulties which children show when having to interpret quantified sentences have to do with a lack of knowledge about the membership and the distribution of the items in a particular scale. In fact, these authors discover that when the members of a scale are explicitly mentioned in a experimental task, children's derivation of SIs increases.

They explain that deriving a SI involves at least four steps:

I. Compute the basic meaning of a sentence S containing L, a scalar item (e.g. *some*). For instance, generate a meaning similar to: *SOME of the animals are sleeping.*

II. Generate a set of alternatives (a1, a2, . . . , an) to S, called $S_{alt}$ (i.e. Sentence Alternatives). These are all the sentences that can be generated by replacing L with its scalar alternatives. For instance: {*ALL the animals are sleeping, MOST of the animals are sleeping*…}.

III. Restrict the alternatives in $S_{alt}$ by removing any alternative that is entailed by the original utterance S. Call this restricted set S*. For instance: {*ALL the animals are sleeping, MOST of the animals are sleeping*}.

IV. Strengthen the basic meaning of S (containing L) with the negation of all of the members of S*. For instance: *SOME but NOT ALL the animals are sleeping.*

Consequently, the knowledge of the scale implies as well 3 levels of knowledge:

a. The identification of the members of the scale (see (24a)).
b. The ordering of the members inside the scale (strong and weak ones), bound to the knowledge that the strong terms of the scale entail the weak ones (see (24b)).
c. The rejection of stronger alternatives in the scale (see (24c)).

(24) a. {some, all, ~~eat~~} → IDENTIFICATION
b. {all, some} → ORDERING
c. {~~all~~, some} → REJECTION

The first level of knowledge is identifying the members of the scale (thus rejecting items which do not belong to the scale, i.e. *eat* in (24a)). The second level of knowledge is ordering the members of the scale (strong and weak ones, i.e. *all*=strong and *some*=weak in (24b)), bound to the knowledge that the strong items of the scale entail the weak ones; in (24b) the weak quantifier *some* is entailed by the strong quantifier *all*, but not the other way around (see section 2.1.2.2). And finally, the third level of knowledge is rejecting the stronger alternatives in the scale, when a weak term holds; in (24c), when the weak quantifier *some* holds, that implies rejecting the stronger alternative of the scale, in this case *all*.

Barner et al. (2011) conduct an experiment with 4-year-old English-speaking children. In the critical trials, three animals (a dog, a cat and a cow) are all sleeping and children are asked if "*some/only some* of the animals are sleeping". While *some* can mean "*some* and maybe *all*" (no derivation of a SI), *only some* restricts the meaning to "*some*, but not *all*" (triggering a SI). Results showed that children said "yes" 66% of the time both with *some* and with *only some*. Children's affirmative answer to the question with *some* was expected by the authors, because *some* does not give rise to a SI *per se*. However, answering "yes" to the question with *only some* indicates that children have difficulties to generate SIs even when this is predicted to be triggered by *only*.

However, when the members of the set of animals were explicitly mentioned (the scalemates), children performed better. When asked if "*only* the cat and the dog are sleeping", they answered "no" 86% of the time. So contextual clues (like mentioning the animals in this case) helped children to construct the relevant alternatives of the set in question. Therefore, Barner et al. (2011) concluded from these findings that it is the lack of knowledge about the membership and the distribution of the items in a particular scale (thus the lack of knowledge about the appropriate entailment relationships between the items) which blocks children from generating a SI. And they add that when scalemates are provided, children's generation of SIs improves significantly.

Moreover, Barner & Bachrach (2010) had already proposed a common semantics for quantifiers and numerals in language acquisition. Other studies (such as the one conducted by Papafragou & Musolino 2003) had stated that only numerals have exact lexical meanings, and that children could not derive SIs to strengthen numeral meanings. Contrary to this view, Barner & Bachrach (2010) argued that the differences observed between numerals and quantifiers are due to the differences in the availability of the respective scales of which they are members. These authors discover that (i) children can derive SIs when interpreting numerals, that (ii) they initially assign (non-exact lexical readings) to

numerals, and that (iii) they can enrich the semantic interpretation of numerals (i.e. derive a SI and thus derive the pragmatic meaning) when the alternatives of the scale in question are made explicitly available.

It has also been observed that (i) more SIs are generated with scales formed by numerals than with those formed by quantifiers, due to the exhaustive (precise) reading of numerals (see Huang et al. 2013), and that (ii) the scales formed by items which are semantically similar to each other generate fewer SIs than those formed by items semantically more distant (see Zevakhina 2012). In fact, Zevakhina (2012) finds that the scales formed by quantifiers such as {all, most, some} generate more implicatures than the scales formed by adjectives like {freezing, cold, cool}, due to its semantic similarity.

More recent studies, such as the one carried out by Röhrig (2015) with 5-, 7- and 9-year-old children and in which the comprehension about the informativeness of the modal verbs *könnte* 'might' and *muss* 'must' is tested, assert that children generate different kinds of implicatures to those of adults: these implicatures correspond to different stages, in which children pay attention to different maxims of Grice's (1975, 1989) Cooperative Principle. Therefore, depending on the maxim they are obeying to, they will generate a different kind of implicature.

The concepts of scale and informativeness, as well as the distinction between the three levels of knowledge previously described are relevant to understand the complexity of the operations involved in the processing of certain linguistic expressions. Pragmatic knowledge overlaps with the semantic one and it is necessary to describe the phases that precede the adult-like knowledge of quantifiers along children's linguistic development.

2.1.4.2.2.3 Methodological effects

One of the results that Noveck (2004) obtained in his extension of the experiment is that children derive more SIs if the experimental task is simplified. They introduced three changes (to the original experimental task in Noveck 2001) in order to reduce the effort to perform the task: first, they employed the French word *quelques* 'some' instead of *certains* 'some', since children were more used to the former; second, all the items were in the boxes and no items were outside the boxes (as happened in the original experiment); and third, participants were asked to perform an acting out task based on the puppet's instructions, rather than a Truth Value Judgment Task (TVJT).

Noveck (2004) found out (having simplified the experimental task from Noveck 2001) that only the 32% of 4-year-old children, only the 27% of 5-year-old children and only the 17% of 7-year-old children accepted under-informative sentences (as compared to the 89% of acceptance of the 7/8-year-old children in the original experiment), what indeed suggested that children were deriving the corresponding SI. Therefore, we can observe that children can derive SIs when having to interpret under-informative quantificational constructions, but that access seems to be restricted by the experimental task or by the linguistic context.

This is precisely what Guasti et al. (2005) defend. These authors state that children's answers in the original experiment of Noveck (2001) are very restricted due to the lack of a natural and appropriate linguistic context. Guasti et al. (2005) conduct three experiments, replicating the material employed by Noveck (2001), but with three main modifications: (i) the participants are Italian-speaking children; (ii) only 7-year-old children are tested; and (iii) only one list of statements (instead of two, as in Noveck 2001) is employed.

First, Guasti et al. (2005) observe that 7-year-old children's competence improves (with "improve" the authors mean that children behave more adult-like, i.e. they tend to convey a pragmatic interpretation, thus reject an under-informative sentence) when these children are exposed to a training session before the experimental task (children with no training accept under-informative sentences in 89% of cases, whereas children with previous training only in 48% of cases). Second, Guasti et al. (2005) find out, however, that the positive effect of the training session only lasts for a short-term period (because the same children after a week, and carrying out the experimental task without the previous training session, resort back again to semantics). Finally, Guasti et al. (2005) prove that controlling the linguistic context (making use of the TVJT; see Crain & McKee 1985, and Crain & Thornton 1998), and providing children with an adequate explanation about how to evaluate the given sentences (i.e. judging if the sentences are as informative as possible with respect to the linguistic context), not only do children radically improve (only 25% of semantic answers), but the adults' semantic answers also decrease (just 17%).

Another study which claims that an appropriate experimental task leads to higher rejection rates of under-informative sentences among children is the one carried out by Papafragou and Musolino (2003). In fact, these authors test the ability of 5-year-old Greek-speaking children to reject under-informative sentences like (25), (26) and (27) in contexts where '*All* of the horses jumped over the fence', '*Three* of the horses jumped over the fence' and "The girl *finished* making the puzzle". A puppet said what had happened and children were asked whether the puppet 'answered well'.

(25) Merika apo ta aloga pidiksan pano apo to fraxti.
some of the horses jumped over of the fence
'Some of the horses jumped over the fence.'

(26) Dio apo ta aloga pidiksan pano apo to fraxti.
two of the horses jumped over of the fence
'Two of the horses jumped over the fence.'

(27) To koritsi arxise na ftiaxni to pazl.
the girl started to make the puzzle
'The girl started making the puzzle.'

In fact, Papafragou and Musolino (2003) decided to manipulate the original TVJT (Crain & McKee 1985; Crain & Thornton 1998) and they conducted two different experiments. While in EXPERIMENT 1 the task is not modified, in EXPERIMENT 2 a manipulation of the experimental task is done: (i) they make slight modifications (such as asking children about felicity conditions instead of truth conditions ("well" vs. "right/wrong"), (ii) they enhance children's awareness of the goal of the task, and (iii) they present contexts which more readily invite children to derive the required pragmatic inferences. As a result, they discover that children's ability to derive SIs is enhanced with those modifications in the experimental task.

Indeed, while in EXPERIMENT 1 (without having manipulated the experimental task) children rejected under-informative sentences 12,5% of the time, in EXPERIMENT 2 (after having modified the experimental task), they rejected under-informative sentences 52,5% of the time. Second, these authors discover as well that children do not treat all scalar items in the same way. In fact, their ability to derive pragmatic inferences is higher with numerals than with other quantified expressions such as *some* (i.e. children's rejection rates with numerals: 65% of the time in EXPERIMENT 1, and 90% of the time in EXPERIMENT 2). This finding leads Papafragou and Musolino (2003) to conclude that, due to their underspecified semantics, numerals should not be treated as other quantified expressions. Moreover, they claim that the pragmatic inferences

associated with numerals are not actually SIs but a way of enriching the underspecified semantic content of the numerals.

In line with the previous study goes the one carried out by Pouscoulous et al. (2007), who claim that a simplified task encourages implicature production even in 4-year-old children. They replicate Noveck's (2001) experimental design, but they decide to introduce three fundamental changes: first, they get rid of any distractor; second, the evaluation of under-informative sentences is based on children's actions rather than on verbal judgments (this way authors are actually testing children's pragmatic competence rather than their metalinguistic knowledge); and third, they employ the French word *quelques* instead of *certains* as a translation of the English word *some* (as in Noveck 2004).

Thus, with this simplified task Pouscoulous et al. (2007) obtain the following results: 68% of pragmatic responses with 4-year-old children, 73% with 7-year-old children, 83% with 9-year-old children and 86% with adults. We can see, therefore, that children have an adult-like behavior in this task.

Nevertheless, Pouscoulous et al. (2007) argue that the Semantics-Pragmatics Developmental Effect (discovered first by Noveck 2001) is still observed in their results (from 4-year-olds, to 7-year-olds, to 9-year-olds, to adults).

### 2.1.5 Summary

The difficulty to derive SIs that children show at an early age has been traditionally attributed to a lack of pragmatic resources (Noveck 2001, 2004; Guasti et al. 2005). However, there are more and more studies which claim that the difficulty to derive SIs is not due to a pragmatic deficit, but to other factors such as (i) the nature of the experimental task (see Papafragou and Musolino 2003; Pouscoulous et al. 2007; a.o.), or (ii) the (lack of) knowledge of the tested

scales (see Barner et al. 2011; Papafragou and Skordos (in press); Huang et al. 2013; Zevakhina 2012; Röhrig 2015; Zufferey 2015).

Although the adaptation of the experimental task to factors such as age, context or ease of comprehension favors a higher derivation of SIs (Papafragou and Musolino 2003; Pouscoulous et al. 2007), the knowledge of the scale (as well as the distribution of its items) is essential to derive SIs (Barner et al. 2011; Papafragou and Skordos (in press); Zufferey 2015).

In this chapter we have observed that the studies dealing with the semantic level of quantifiers (see Hanlon 1988, Just & Carpenter 1971, Katsos et al. (2016[2012])) obtain similar results crosslinguistically, that is, children seem to follow the same steps regardless of their native language when establishing the semantic meaning of quantifiers.

As regards the pragmatic level of quantification, alternative approaches have been proposed: the "Pragmatic Deficit Stage Approach" (Noveck 2001, 2004) and the "Scalar Approach" (Barner et al. 2011). In spite of the divergences found between different studies, all of them share the common rationale that the knowledge of the scale in question influences in a positive or negative way the derivation of the corresponding SI.

It has also been observed that 5 is the age at which the vast majority of semantics is already acquired, but there are other domains such as pragmatics which are not still mastered (see Noveck 2001, 2004; Guasti et al. 2005; a.o.).

Moreover, the literature on quantification has also shown (see Noveck 2004; Guasti et al. 2005; Papafragou and Musolino 2003; Pouscoulous et al. 2007) that the experimental design has an impact on the outcome not only with children but also with adults.

## 2.2 SYNTAX

This section focuses on the interaction between universal quantifiers and the negative operator. For that purpose, some of the syntactic properties (2.2.1) of quantifiers will be described and the studies on quantification dealing with isomorphism will be summarized (2.2.2).

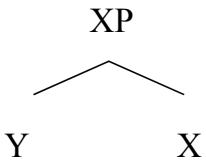
### 2.2.1 Syntactic properties

2.2.1.1 Scope

May (1977, 1985) constituted the first and one of the most important attempts to develop a syntactic theory of quantification. He proposed that the SCOPE of a quantifier is the domain within which the quantifier affects the interpretation of the other expressions in a sentence (i.e. other quantifiers, noun phrases, negation, etc.). He proposed a syntactic operation, QUANTIFIER RAISING (QR), by which quantifiers adjoin to any DOMINATING maximal projection (XP) in order to take scope.

In (28) the maximal projection XP DOMINATES both Y and X, since an imaginary line from XP to Y and from XP to X (going only downwards) can be traced. In this way, Y does not dominate XP nor X, and X does not dominate XP nor Y.

(28)



The process of QR happens between the Surface Structure (SS) and the Logical Form (LF), it is therefore a covert operation.[7] When an element rises to take scope, it leaves a TRACE, which is the variable that the operator (the quantifier in this case) binds.[8]

2.2.1.2 Polarity

Another characteristic that natural quantifiers share is related to polarity, that is, the fact that they can interact with negation, as in (29). We assume that the markers of sentential negation (i.e. negative operators) are functional heads, $Neg_o$, which project a Negative Phrase (NegP) (cf. Pollock 1989; Laka 1990; Zanuttini 1991).

(29) Every horse did not jump over the fence.

In (29) the quantifier 'every' linearly precedes the negative operator 'not', so its SURFACE/OVERT SYNTACTIC SCOPE is UnivQ>Neg; however, the SEMANTIC SCOPE of (29) is ambiguous, since it can give rise to two different semantic interpretations (30a,b). Saeed (2016; p. 453) describes semantic scope as "the range or limit of dependency of one item upon another in a structure, for example of a quantifier and a variable in logic or a negative word in a sentence. Scope ambiguity occurs when two or more ranges can be identified, giving rise to different meanings".

[7] According to Chomsky (1965, 1981), sentences have distinct levels of representation. The SS — later reanalyzed as "Spell-out" within the Minimalist Program (Chomsky, 1993) — is the actual expression of the sentence, whilst the LF is the mental representation of that sentence. The meaning obtained by LF is derived from the transformations/operations that occur between SS and LF and these are called COVERT operations, since they are non-visible on the surface. In fact, a covert operation which happens between SS and LF is related to the SCOPE of quantifiers.

[8] In fact, the "Empty Category Principle (ECP)" states (see Chomsky, 1981) that traces left by quantifiers (or by wh-phrases) have to be properly governed: either by theta-government (when the trace is the complement of its governor, i.e. a head like a verb or a preposition), or by antecedent-government (when the trace is locally c-commanded and co-indexed by its antecedent, i.e. the quantifier or the wh-phrase).

(30) a. ∀x [horse (x) → ¬ jump over the fence (x)]
'For every horse, it is such that it didn't jump over the fence', hence 'none did'

b. ¬∀x [horse (x) → jump over the fence (x)]
'It is not the case that every horse jumped over the fence', hence 'not all did'

(30a) provides the representation for the semantic scope UnivQ>Neg, in which the universal quantifier takes scope over the negative operator, giving rise to a 'none' reading; (30b) conveys the semantic scope Neg>UnivQ, where the negative operator *not* (¬) takes scope over the universal quantifier *every* (∀), leading to a 'not all' reading. While (30a) represents the ISOMORPHIC interpretation of (29), since the semantic scope (UnivQ>Neg) corresponds to the surface/overt syntactic scope (UnivQ>Neg), (30b) represents the NON-ISOMORPHIC interpretation of (29), since the semantic scope (Neg>UnivQ) does not correspond to the the surface/overt syntactic scope (UnivQ>Neg).

### 2.2.2 Empirical research

2.2.2.1 Isomorphism

2.2.2.1.1 Linear isomorphism

The issue of the interaction between quantifiers and negation in L1 acquisition has been a relevant theoretical topic since the second half of the nineties (Musolino 1998; Lidz & Musolino 2002; Musolino & Lidz 2006; Moscati & Gualmini 2008; a.o.). The main research question that these authors have addressed is if children can access both the ISOMORPHIC (i.e. surface scope) and the NON-ISOMORPHIC (i.e. non-surface scope) interpretations (see (30a) and (30b), respectively) of sentences which contain a universal quantifier plus a negative operator (like (29)), or if they can only access the isomorphic

interpretation of those types of sentences. In fact, Musolino (1998; p. 112) observed that 4- and 5-year-old children can only access the isomorphic interpretation of sentences like (29) and he proposed the "Observation of Isomorphism" described in (31) (Musolino et al. 2000).

(31) *Observation of Isomorphism*
Children's semantic scope coincides with overt syntactic scope.

Musolino et al. (2000) claimed that children's semantic interpretation of sentences like (29) is based on the syntactic scope or interpretation that corresponds to the overt syntactic order of the quantifiers.

Several studies on the acquisition of quantification also found a strong preference for the isomorphic interpretation of sentences like (29) (see Musolino & Gualmini 2004; Noveck et al. 2007; Han et al. 2007; a.o.).

However, other studies on early language acquisition (see section 2.2.2.1.2) addressed the question whether isomorphism should be described in structural (c-command relationship) or linear terms (surface scope order).

2.2.2.1.2 Structural isomorphism

Lidz and Musolino (2002) discovered that 4-year-old children, native speakers of English (a head-initial language) and Kannada (a head-final language, spoken in the state of Karnataka, in the southeast of India, and whose canonical word order is SOV), relied on the C-COMMAND (CONSTITUENT-COMMAND) information given by the syntactic structure when having to interpret a sentence with a negative operator plus a numeral quantifier.[9]

[9] A node A c-commands a node B if and only if: (i) A does not dominate B, (ii) B does not dominate A and (iii) the first branching node which dominates A dominates B (Carnie, 2002).

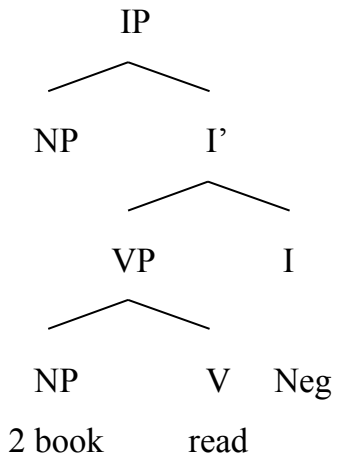
It is important to highlight the fact that while in English the sentential negative marker *n't* precedes the numeral quantifier *two* linearly as in (32), in Kannada it is the other way around as can be observed in (33) (examples taken from Lidz and Musolino 2002).

(32) I didN'T read TWO books

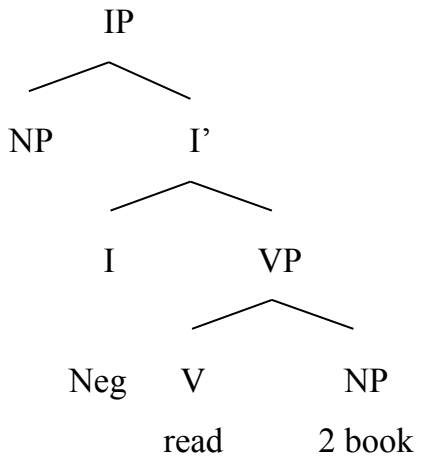
(33) naanu eraDu pustaka ood-al-illa
I-nom TWO book read-inf-NEG
'I didn't read two books'

The fact that in both languages (Kannada and English) children obtain the same interpretation (the negative operator taking scope over the numeral quantifier; Neg>Q) suggests that 4-year-old children do not rely on the linear word order of sentences (Neg-Q / Q-Neg), but they do rely on the c-command information provided by the given sentence (see example (34), taken from Lidz and Musolino 2002), because if they were relying on the lineal word order of the sentence, the Kannada children would obtain just the opposite interpretation (the numeral quantifier taking scope over the negative operator; Q>Neg), as it is the numeral quantifier *eraDu* which linearly precedes the negative operator *illa*.

(34) Kannada




English



In (34) we can observe that in both Kannada and English it is the negative operator *Neg* which c-commands the NP *2 book*, and not the other way around.

In a subsequent study, Musolino and Lidz (2006) discovered that with an appropriate linguistic context, 5-year-old children could access more readily to the non-isomorphic readings of sentences like (32) and (33). However, they claimed that children's cognitive resources to derive non-isomorphic interpretations are much more fragile than those of adults.

Another study in line with Lidz & Musolino (2002) is the one conducted by Gualmini & Crain (2005). These authors found out that 4/5-year-old children resorted to syntactic principles (and specifically to c-command information), in order to know if the particle *or* was conjunctive or disjunctive in a series of negative sentences. In fact, when the negative operator has scope over *or*, this particle is conjunctive, but when the negative operator does not have scope over *or*, this particle is disjunctive (this is known as "De Morgan's Law"). Gualmini & Crain (2005) uphold, therefore, that the syntactic structure (and specifically the c-command information) is the main source of interpretation for 4/5-year-old children, rather than the information provided by linear order.

### 2.2.3 Summary

In section 2.2.2 the main studies on language acquisition dealing with the interaction between quantifiers and negation have been described, and more specifically, the interpretations that children obtain when they are confronted with different orders between the quantifier and the negative operator are detailed (i.e. Q-Neg vs. Neg-Q).

The "Observation of Isomorphism" (Musolino et al. 2000) predicts that children's semantic scope will coincide with overt syntactic scope (i.e. linear isomorpshism), whereas structural isomorpshism (Lidz & Musolino 2002)

proposes that an important cue for interpretation is not linearity (the information obtained from the linear order/sequence of words), but the c-command relation between the quantifier and the negative operator.

# CHAPTER 3: THE PRESENT STUDY

Considering (i) the semantic, pragmatic, and morphosyntactic properties of quantifiers described in Chapter 2 and (ii) the existing literature on early language acquisition and language processing, the main interest of the present study is to observe, describe and analyze children's acquisition and development and adults' interpretation of quantification in the two official languages of the Basque Country in Spain ─ Basque and Spanish.[10]

In this chapter the main Hypotheses (HYP) and Research Questions (RQ) (section 3.1) will be presented, the design and instrument will be described (section 3.2), the sociolinguistic context will be detailed (section 3.3), the participants will be introduced (section 3.4) and the predictions will be formulated (section 3.5).

## 3.1 HYPOTHESES AND RESEARCH QUESTIONS

In light of the literature described in Chapter 2, this dissertation proposes the following hypotheses:

**HYP1.** Children show a gradual acquisition of the semantic properties of quantifiers (totality, partiality, proportionality, monotonicity) (Katsos et al. 2012, 2016).

**HYP2.** Children acquire the semantic properties of quantifiers before the pragmatic ones (Noveck 2001, 2004; Katsos et al. 2012, 2016).

[10] We are specifying "the Basque Country of Spain", as all the data were gathered in this region. In any case, the current sociolinguistic context of both Hegoalde (the Basque Country of Spain) and Iparralde (the Basque Country of France) will be explained in section 3.3.

**HYP3.** The "Observation of Isomorphism" accounts for children's interpretation of sentences containing a universal quantifier and a negative operator (Musolino 1998; Musolino et al. 2000).

**HYP4.** There is no bilingual advantage as regards the derivation of SIs (Siegal et al. 2007; Antoniou et al. 2013; Syrett et al. 2017).

Based on these hypotheses and taking into account the sociolingusitic context of the Basque Country (described in section 3.3), the present dissertation aims to answer the following research questions (RQ):

**RQ1.** How and when do Basque and Spanish children acquire the semantic properties of positive and negated quantifiers (Katsos et al. 2012, 2016)?

**RQ2.** Which factors influence on the acquisition of the pragmatic properties of quantifiers? Do we observe 'a pragmatic deficit stage' (Noveck 2001) or is there a lack of knowledge about the scalar items in question ('Scalar Approach'; Barner et al. 2011)?

**RQ3.** Does the "Observation of Isomorphism" (Musolino 1998; Musolino et al. 2000) account for Basque and Spanish children's interpretation of sentences containing a universal quantifier and a negative operator?

**RQ4.** Is there a bilingual advantage as regards the derivation of SIs (Siegal et al. 2007; Antoniou et al. 2013; Syrett et al. 2017)?

In order to answer those questions, different experiments were conducted, whose methodology is described in detail in section 3.2.

## 3.2 DESIGN AND INSTRUMENT

Two experiments were conducted, EXPERIMENT 1 and EXPERIMENT 2, and EXPERIMENT 1 was carried out in two different versions, Version 1 and Version 2. Both EXPERIMENT 1 and EXPERIMENT 2 are experimental off-line tasks and they measure comprehension oral data. EXPERIMENT 1-Version 1 was conducted in order to test HYP1, HYP2 and HYP4 and to answer RQ1, RQ2 and RQ4, related to the semantics-pragmatics interface. EXPERIMENT 1-Version 2 and EXPERIMENT 2 were conducted in order to test HYP3 and to answer RQ3, related to syntax (see section 3.1).

EXPERIMENT 1 is the adaptation to Spanish and to Basque of the linguistic items in the materials from Katsos et al. (2012) and it is a Sentence Evaluation Task (SET). [11] In Version 1 of EXPERIMENT 1 the comprehension of the following quantifiers was tested:

- Spanish: *todos* 'all', *ninguno* 'none', *algunos* 'some', *la mayoría* 'most', *no todos* 'not all' and *algunos no* 'some not'.

- Basque: *guztiak* 'all', *bat ere ez* 'none', *batzuk* 'some', *gehienak* 'most', *guztiak ez* 'all not' and *batzuk ez* 'some not'.

The results obtained with positive and negated quantifiers (though being part of the same experiment) are presented separately, in order to keep the distinction between positive and negative scales: {all, most, some}; {none, not all, some not} (Horn, 1972), following the rationale that the direction of the implicature is reversed from one scale to the other (see section 2.1.1.3).

[11] I am very grateful to the research group "COST A33" and especially to Napoleon Katsos (Principal Investigator of the project) for allowing me to participate in their project and use their material as a basis to make modifications and collect data for the present study. I am very grateful as well to María José Ezeizabarrena for the Basque adaptation of the material.

The results obtained with the positive quantifiers (*todos*, *algunos* and *la mayoría* in Spanish, and *guztiak*, *batzuk* and *gehienak* in Basque) are presented in section 4.1.5 and the results of the negated quantifiers (*ninguno*, *no todos* and *algunos no* in Spanish, and *bat ere ez*, *guztiak ez* and *batzuk ez* in Basque) are plotted in section 5.1.5.

In Version 2 of EXPERIMENT 1 a slight modification of the materials was made and the inverse order of the negated universal quantifiers was tested: *todos no* (UnivQ-Neg) for Spanish and *ez guztiak* (Neg-UnivQ) for Basque. The results obtained with this version are presented in section 6.3.3.

EXPERIMENT 2 is a Picture Selection Task (PST). In this experiment the interaction between the universal quantifiers *guztiak* for Basque and *todos* for Spanish and the negative operator is investigated, including Neg-UnivQ in EXPERIMENT 1 and a modified version (UnivQ-Neg) in EXPERIMENT 2. The results obtained with this experiment are presented in section 6.4.5.

### 3.2.1 EXPERIMENT 1 (SET)

3.2.1.1 Version 1

3.2.1.1.1 Instrument

The instrument employed in this experiment is a Sentence Evaluation Task (SET) which measures participants' acceptability judgments. It has two components: it consists of an audio-visual Power Point presentation (the material shown to the participants), as well as a score-sheet (which is employed by the experimenter to write down the oral answers and the explanations given by the participants and controls).

In this version the comprehension of the following quantifiers was tested: *todos*, *ninguno*, *algunos*, *la mayoría*, *no todos* and *algunos no* in Spanish, and *guztiak*, *bat ere ez*, *batzuk*, *gehienak*, *guztiak ez* and *batzuk ez* in Basque.

3.2.1.1.2 Procedure

The experiment was conducted in a silent room (at schools) and both the experimenter and the children (one by one) looked at a computer were the presentation was projected. Children's task was to help a friend called the Cavegirl to learn the target language, because she did not know the language in question very well and she could make mistakes.

First a Warm-Up Exercise was conducted, with 5 sentences, containing numeral quantifiers. This Warm-Up Exercise provided children with a clearer background of the task (so as to understand the "game" better), and when it finished, they were told that from that moment on they would not continue playing with words such as *one* or *five*, but that they would play with other kinds of words. Children were given this explanation in order to avoid situations in which they could reject a sentence for not containing a numeral quantifier.

In the audio-visual Power Point presentation a set of slides appeared, in which 5 objects were contained (or not) in 5 boxes, and in which some sentences describing the situation were uttered by the Cavegirl. Participants were asked to evaluate whether the sentence produced by the Cavegirl was accurate to the picture.

On each slide of the presentation 5 boxes and 5 identical objects were represented (balls, oranges, etc.). The items were presented in 4 different contexts:

(35) a. '0/5 context': 0 objects are inside the boxes (see Figure 1).
b. '2/5 context': 2 objects are inside the boxes (see Figure 2).
c. '4/5 context': 4 objects are inside the boxes (see Figure 3)
d. '5/5 context': the 5 objects are inside the boxes (see Figure 4).

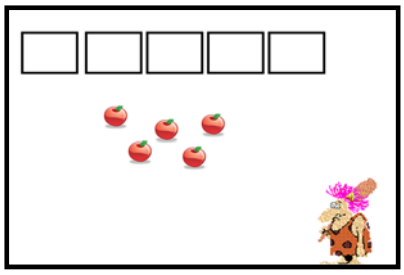


Figure 1: 0/5 context

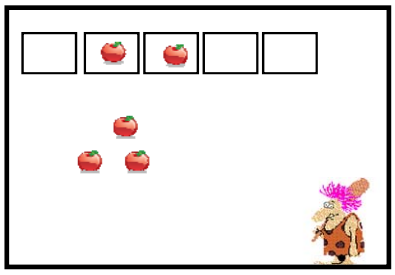


Figure 2: 2/5 context

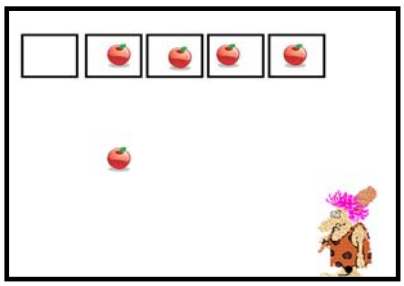


Figure 3: 4/5 context

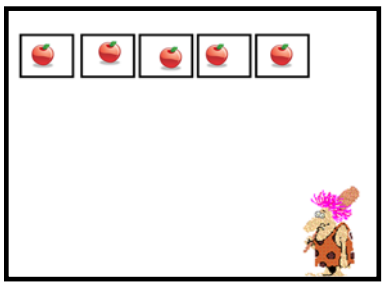


Figure 4: 5/5 context

The four different contexts in (35) above were employed in order to test two meanings: (i) the Semantic Meaning (SM) of the quantifiers, where the truth-values of the sentences were tested with respect to the context, and (ii) the Pragmatic Meaning (PM), where the acceptability of the sentences was tested in a context in which its use was pragmatically infelicitous (the critical condition of the experiment). All the test sentences employed for each of the quantifiers with both meanings (SM and PM), the contextual arrangement on the screen (number of items in the boxes) and the target responses (right or wrong) can be seen in Appendices 1 and 2 (for Spanish and Basque, respectively). All the quantifiers were tested for their PM and SM, except for *todos* and *ninguno* in Spanish and *guztiak* and *bat ere ez* in Basque, which were only tested for their SM (since they cannot be tested in an under-informative condition).

For the PM, 6 sentences were tested with each quantifier (*algunos*, *la mayoría*, *no todos* and *algunos no* in Spanish, and *batzuk*, *gehienak* , *guztiak ez* and *batzuk ez* in Basque). The expected Target (adult-like) Response (TR) was to

reject the sentences (to say 'Wrong'), based on the fact that the sentences are pragmatically infelicitous, because they are not as informative as possible (see section 2.1.1.4). That is, a test sentence like (36), uttered in a context where 5 out of 5 apples are in the boxes is semantically true but pragmatically infelicitous, since the use of the weak quantifier *some* from the scale {all, some} is under-informative in that context, and the stronger quantifier *all* should be employed.

(36) Some apples are in the boxes

For the SM, 6 sentences were tested with each quantifier as well (*todos*, *ninguno*, *algunos*, *la mayoría*, *no todos* and *algunos no* in Spanish, and *guztiak*, *bat ere ez*, *batzuk*, *gehienak*, *guztiak ez* and *batzuk ez* in Basque). For half of the sentences (3 out of 6 with each quantifier) the TR is to accept the sentences (to say 'Right'), taking into account that the truth-values of the sentences are satisfied by the context. Thus, uttering (36) in a context where 2 out of 5 apples are in the boxes, is semantically true, since the truth-values of the sentence are satisfied in that context. For the other half of the sentences, the TR is to reject the sentences (to say 'Wrong'), based on the fact that the truth-values of the sentences are not satisfied by the context. So uttering (36) in a context where 0 out of 5 apples are in the boxes is semantically false, since the truth-values of the sentence are not satisfied in that context.

In Table 1 the experimental items for Spanish (Sp) and for Basque (B), the meanings tested and the possible contexts are presented, together with the Target Response (TR), the number of items (per meaning and quantifier) and a brief explanation is given.

| Quantifier (Q) | English translation | Meaning tested | Nº of Items | Context (C) | The Q in that C is… | Target (adult-like) Response |
|---|---|---|---|---|---|---|
| Sp: *todos* B: *guztiak* | 'all' | SC | 3 | 5/5 | Semantically true | Right |
| | | | 3 | 2/5 | Semantically false | Wrong |
| Sp: *ninguno* B: *bat ere ez* | 'none' | SC | 3 | 0/5 | Semantically true | Right |
| | | | 3 | 2/5 | Semantically false | Wrong |
| Sp: *algunos* B: *batzuk* | 'some' | PC | 6 | 5/5 | Pragmatically infelicitous (under-informative) | Wrong |
| | | SC | 3 | 2/5 | Semantically true | Right |
| | | | 3 | 0/5 | Semantically false | Wrong |
| Sp: *la mayoría* B: *gehienak* | 'most' | PC | 6 | 5/5 | Pragmatically infelicitous (under-informative) | Wrong |
| | | SC | 3 | 4/5 | Semantically true | Right |
| | | | 3 | 2/5 | Semantically false | Wrong |
| Sp: *no todos* B: *guztiak ez* | 'not all' | PC | 6 | 0/5 | Pragmatically infelicitous (under-informative) | Wrong |
| | | SC | 3 | 2/5 | Semantically true | Right |
| | | | 3 | 5/5 | Semantically false | Wrong |
| Sp: *algunos no* B: *batzuk ez* | 'some not' | PC | 6 | 0/5 | Pragmatically infelicitous (under-informative) | Wrong |
| | | SC | 3 | 2/5 | Semantically true | Right |
| | | | 3 | 5/5 | Semantically false | Wrong |

Table 1: Codification - Sentence Evaluation Task (SET – Version 1)

There are 60 sentences in total and these sentences are distributed across six Blocks (from Block A to Block F) pseudo-randomly, so as to avoid repetitions. Each block contains one item from each critical condition (PM) for each quantifier.

There are two breaks (introduced after Block B and Block D) where fillers are included. In these Breaks, another character appeared, the Caveboy (the Cavegirl's friend), and he asked the children to point to different shapes and pictures which would appear on the screen.

With respect to technical matters, the voice recordings of the Cavegirl and of the Caveboy were made with a female and a male voice, respectively (both native speakers of the languages under study), thus all participants were exposed to the same experimental input.

#### 3.2.1.2 Version 2

In Version 2 of EXPERIMENT 1 a slight modification of the materials was made and the inverse order of the negated universal quantifiers was tested: *todos no* 'all not' (UnivQ-Neg) for Spanish and *ez guztiak* 'not all' (Neg-UnivQ) for Basque. The reason behind this modification was to observe if the different position of the negative operator with respect to the universal quantifier had an effect on the interpretation of the sentences in question.

The materials employed and the procedure followed in this Version (2) was exactly the same as in Version 1. The test sentences employed for each of the quantifiers with both meanings (SM and PM), the contextual arrangement on the screen (number of items in the boxes) and the target responses (right or wrong) can be seen in Appendices 3 and 4 (for Spanish and Basque, respectively).

### 3.2.2 EXPERIMENT 2 (PST)

EXPERIMENT 2 is a Picture Selection Task (PST), based on the materials of Katsos et al. (2012). In this experiment the interaction between the universal quantifiers *guztiak* for Basque and *todos* for Spanish and the negative operator is further investigated, including Neg-UnivQ in EXPERIMENT 1 and a modified version (UnivQ-Neg) in EXPERIMENT 2 (see Appendices 5 and 6, for the complete lists of items in Spanish and Basque, respectively).

The two pictures presented on each slide represented two different contexts:

- '0/5 context': here 0 out of 5 objects are inside the boxes (further interpreted as the *none*-reading).

- '2/5 context': here 2 out of 5 objects are inside the boxes (further interpreted as the *some*-reading).

12 utterances were produced for the quantifier *no todos / ez guztiak* (Neg-UnivQ), and another 12 utterances for the quantifier *todos no* / *guztiak ez* (UnivQ-Neg). With each quantifier, 6 utterances were produced in a visual-setting where the '0/5 context' was on the left-side and the '2/5 context' on the right-side of the screen (see Figure 5), and the other 6 utterances were produced in a visual-setting where the '2/5 context' was on the left-side and the '0/5 context' on the right-side of the screen (see Figure 6).

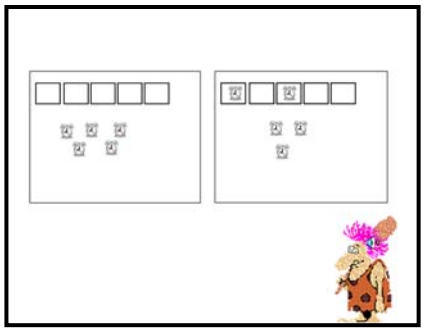


Figure 5: 0/5 & 2/5 contexts

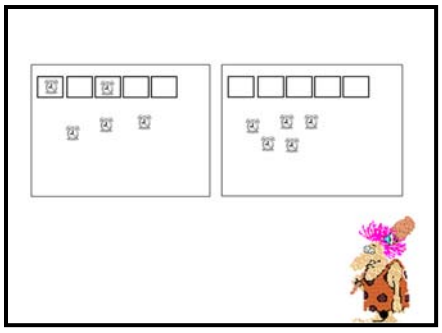


Figure 6: 2/5 & 0/5 contexts

The utterances produced for the quantifiers *no todos / ez guztiak* and the ones produced for the quantifiers *todos no* / *guztiak ez* were like the sentences in Version 2 of EXPERIMENT 1.

Apart from the 24 test items (12 for each quantifier), there were 5 training items with numerals (at the beginning of the experiment), 8 distractors and 24 fillers (61 slides in total). Within the fillers, there were 12 items which tested the quantifier *algunos / batzuk* 'some', and another 12 which tested the quantifier *ninguno / bat ere ez* 'none'.

As with the test items, both with *algunos / batzuk* and with *ninguno / bat ere ez* , 6 fillers were produced in a visual-setting where the '0/5 context' was on the left-side and the '2/5 context' on the right-side of the screen, and the other 6 fillers were produced in a visual-setting where the '2/5 context' was on the left-side and the '0/5 context' on the right-side of the screen.

The difference between the PST and the SET is that in EXPERIMENT 1 (SET) participants were asked to evaluate whether the sentences produced by the Cavegirl matched the pictures presented on the screen. In that experiment, participants evaluated if they accepted or rejected a specific reading, but they could not express their preference for one reading over the other. In addition, it could also be the case that the participants (especially children) could have developed the tendency to accept the utterances (i.e. some sort of *yes*-bias),

instead of rejecting them (see Ambridge and Rowland 2013). Thus, while the SET tested for *acceptance*, the PST tested for *preference*, enabling us to gather different pieces of information.

### 3.2.3 Quantifiers tested in Basque and Spanish

For the reader's convenience, based on the description given in Chapter 2 on the main characteristics of quantifiers, this is the way we are going to be referring to the quantifiers tested in the present dissertation:

**Spanish**

*todos* 'all': Spanish Universal Quantifier (UnivQ)
*ninguno* 'none': Spanish Negative UnivQ
*algunos* 'some': Spanish Weak Partial Q
*la mayoría* 'most': Spanish Proportional Q
*no todos* 'not all': Spanish Neg-UnivQ
*todos no* 'all not': Spanish UnivQ-Neg
*algunos no* 'some not': Spanish Partial Q-Neg

**Basque**

*guztiak* 'all': Basque UnivQ
*bat ere ez* 'none': Basque Negative UnivQ
*batzuk* 'some': Basque Weak Partial Q
*gehienak* 'most': Basque Proportional Q
*ez guztiak* 'not all': Basque Neg-UnivQ
*guztiak ez* 'all not': Basque UnivQ-Neg
*batzuk ez* 'some not': Basque Partial Q-Neg

## 3.3 SOCIOLINGUISTIC CONTEXT

Research in the Basque Country is of great interest, because it represents a sociolinguistically diverse region. Basque is spoken in the north of Spain (Hegoalde or the Basque Country of Spain: Araba, Bizkaia, Gipuzkoa and Nafarroa) and in the south of France (Iparralde or the Basque Country of France: Lapurdi, Nafarroa Beherea and Zuberoa). In this dissertation, we concentrate on Hegoalde or the Basque Country of Spain.

The two official languages of the Basque Country in Spain are Basque and Spanish, and three different educational models are followed at schools: [12] Model A, by which all the subjects are taught in Spanish, except the Basque language subject; Model B, through which the 50% of the subjects is taught in Spanish and the other 50% in Basque; and Model D, by which all the subjects, except the Spanish language subject, are taught in Basque. In Nafarroa, there are two additional educational models: Model G, through which all the subjects are taught in Spanish, and the Basque language subject is not included in the teaching schedule; and the Model PAI (Programa de Aprendizaje de Inglés; "Programme for the Learning of English"), where a part of the subjects is taught in Spanish and another part in English, and they offer the possibility to take the Basque language as an optional subject (4 hours per week).

While Basque is the dominant language in some places of the Basque Country of Spain, it is the second language in other areas or non-spoken in some Spanish-dominant areas. Speakers can be distinguished into different types: (i) Spanish-dominant speakers who have acquired Basque as a second language (L2); (ii) early bilinguals who have acquired Basque and Spanish in a successive way (cL2) (either first Basque and second

12 "Estatuto de Autonomía para el País Vasco (Ley 10/1982)". A detailed description of the different educational models in the Basque Country can be found in: http://www.eustat.eus/documentos/opt_0/tema_279/elem_1521/definicion.html#axzz3lhduTQwF

Basque); (iii) early bilinguals who have acquired Basque and Spanish in a simultaneous manner (2L1); (iv) monolingual speakers of Spanish; and (v) Basque-dominant speakers who have acquired Spanish as an L2. On top of the distinct linguistic profiles, there are different Basque dialects or *euskalkiak* throughout the whole country, what makes the linguistic context even more heterogeneous and rich (Bonaparte 1868; Montrul 2008; Meisel 2012; Grosjean and Li 2013).[13]

In Figure 7 the current linguistic competence in all the Basque-speaking regions is plotted.[14] Green symbolizes Basque native speakers, pink represents new Basque speakers and blue denotes Spanish- (or French-) dominant speakers.[15] We can observe that Gipuzkoa has the highest percentage of Basque native speakers (50,6%), in comparison to Bizkaia (27,6%), Araba (19,2%) and Nafarroa (12,9%).

[13] Analysing the acquisition of quantification in the distinct Basque dialects goes beyond the scope of this work, but it would be worth studying in further research.
[14] Source: the 6th Sociolinguistic Survey of EUSTAT (the Basque Institute of Statistics). This applies for Graphs 1, 2 and 3.
[15] As the data for this dissertation were gathered in the Basque Country of Spain, we are going to focus on the linguistic competence of that region, i.e. Araba, Bizkaia, Gipuzkoa and Nafarroa.

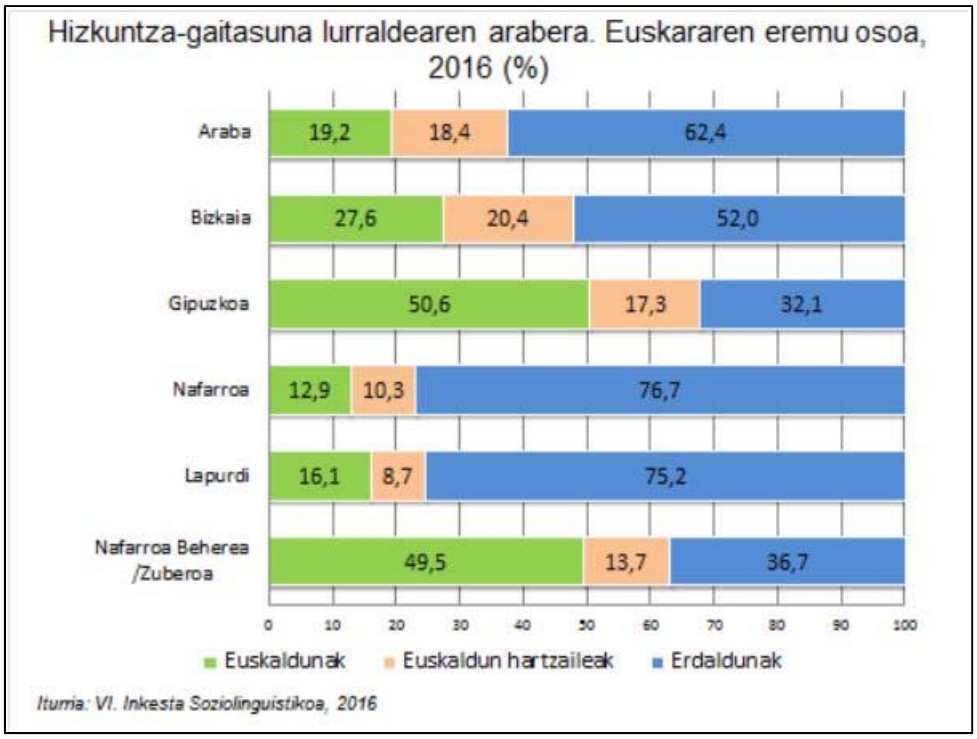



Figure 7: Linguistic Competence in the distinct areas of the Basque Country

In Figure 8 the first language (L1) in the different Basque-speaking regions is shown. Green symbolizes Basque as the L1, pink represents Basque and Spanish (or French) as the L1 and blue denotes Spanish (or French) as the L1. We can see that only-Basque is the L1 in Gipuzkoa in 32,9% of cases, as compared to Bizkaia (11,9%), Nafarroa (6,2%) and Araba (3,8%).

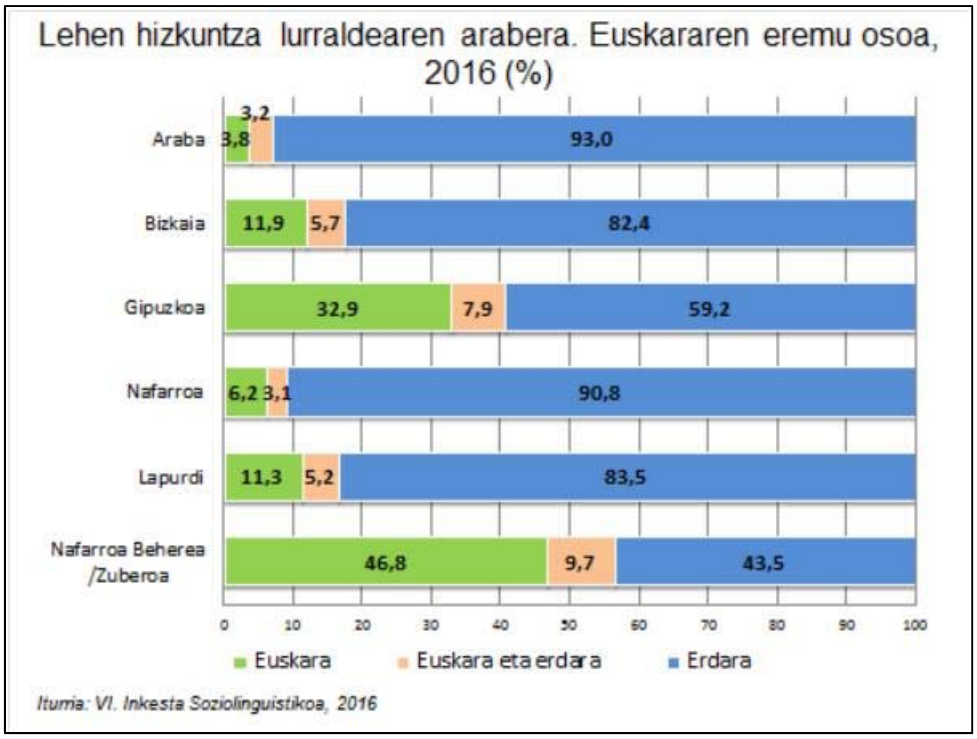



Figure 8: First Language (L1) in the distinct areas of the Basque Country

In Figure 9 the usage of Basque in all the Basque-speaking regions is reflected. Green symbolizes more usage of Basque than Spanish (or French), orange expresses Basque and Spanish usage at the same rate, pink represents less usage of Basque than Spanish (or French), light blue symbolizes very little usage of Basque and dark blue denotes an always-Spanish (or -French) usage. We can observe that more-Basque than Spanish is used in Gipuzkoa in 28,2% of cases, in contrast to Bizkaia (7,5%), Nafarroa (3,7%) and Araba (1,7%).

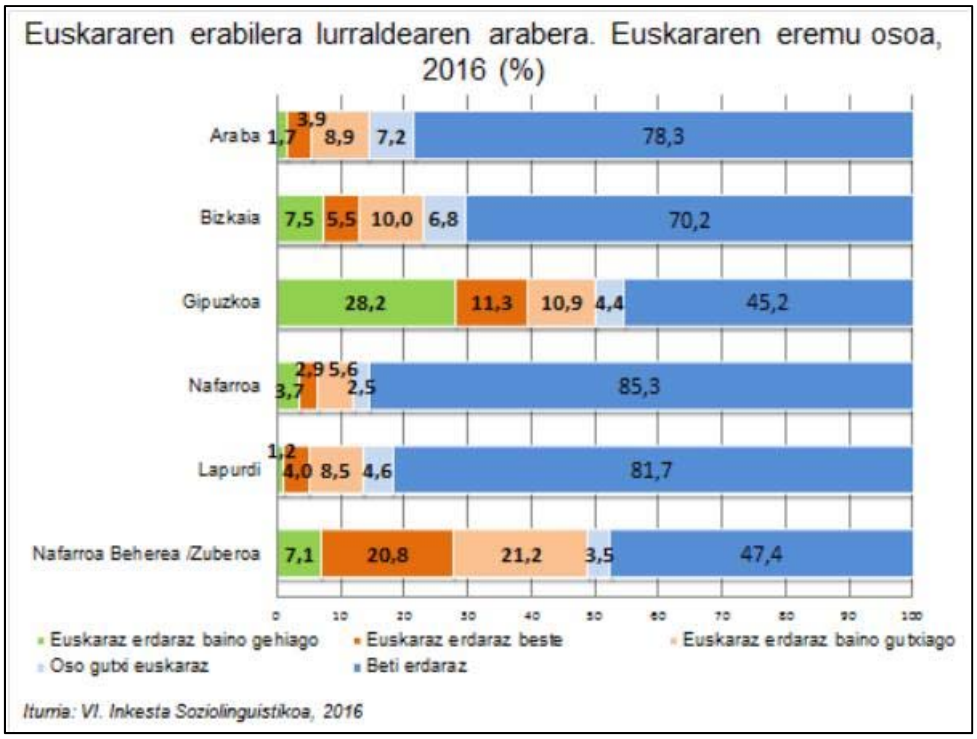



Figure 9: Basque Usage in the distinct areas of the Basque Country

From the above data it can be concluded that Basque has the strongest presence (linguistic competence, L1 and usage) in Gipuzkoa. On the second place, there is Bizkaia and, on the third place, there are Nafarroa and Araba.

Although the presence of Spanish is stronger in Bizkaia, Nafarroa and Araba (as compared to Gipuzkoa), it is worth highlighting that new Basque speakers have emerged (Figure 7) and that Basque is employed at the same rate as Spanish by part of the population in those areas. Therefore, we can observe that research on Basque–Spanish bilingualism is of great interest, due to the rich sociolinguistic diversity of the Basque Country.

## 3.4 PARTICIPANTS

A total of 384 native speakers of Basque and Spanish (children and adults) participated in the experiments carried out for the present dissertation, whose data were collected between the years 2011-2016. Participants were divided into different groups across tasks:

- **FLA study**: 310 participants were recruited for Versions 1 and 2 of EXPERIMENT 1 and EXPERIMENT 2, where data from participants' L1 were collected. For the FLA study, see Chapters 4, 5 and 6.

- **Bilingual study**: 74 participants were recruited for the study on bilingualism, where data from the participants' two L1s were collected. For the Bilingual study, see Chapter 7.

A main concern of the present dissertation was to control (as far as possible) that each group of participants shared the same (or the most similar) linguistic profile. We selected native speakers of the language in question (either Spanish or Basque), both in the case of children and adults, based on a linguistic questionnaire previously administered (see Appendix 7).

In Table 2 information about the participants in the FLA study is given (divided by experiment, version, language of the experiment, linguistic profile, age and place of residence):

| Experiment | Version | Language of the Experiment | Linguistic Profile of Participants | Age | Place | Number of Participants |
|---|---|---|---|---|---|---|
| **Sentence Evaluation Task (SET)** | V1 | Spanish | L1Spanish | 4-5 | Gasteiz/Iruña | 38 |
| | | | | 6-7 | Gasteiz/Iruña | 23 |
| | | | | Adults | Gasteiz/Lizarra | 12 |
| | | Basque | L1Basque | 4-5 | Ordizia/Ibarra | 21 |
| | | | | 6-7 | Ordizia/Ibarra | 37 |
| | | | | 8-9 | Ordizia | 17 |
| | | | | Adults | Gasteiz/Orereta | 10 |
| | V2 | Spanish | L1Spanish | 5-6 | Iruña | 14 |
| | | | | Adults | Gasteiz/Lizarra | 12 |
| | | Basque | L1Basque | 5-6 | Ordizia | 25 |
| | | | | Adults | Gasteiz/Orereta | 10 |
| **Picture Selection Task (PST)** | ---------- | Spanish | L1Spanish | 5-6 | Iruña | 25 |
| | | | | Adults | Gasteiz/Lizarra | 17 |
| | | Basque | L1Basque | 5-6 | Ordizia/Ibarra | 27 |
| | | | | Adults | Gasteiz/Orereta | 22 |
| | | | **TOTAL Nº OF PARTICIPANTS:** | | | **310** |

Table 2: Summary of Participants in the FLA study

In Version 1 of the SET data from different child-age groups as well as adult controls were collected. It has been observed in previous literature (see Noveck 2001, 2004; Guasti et al. 2005; a.o.) that 5 is the age at which the vast majority of semantics is already acquired, but there are other domains such as pragmatics which are not still mastered. For this reason, in Version 1 of the SET data of 4-to-9-year-old children were collected in order to see the age at which

children start behaving adult-like, which means making use of pragmatic resources in relation to quantification and the derivation of SIs. Data from 8-9-year-old L1 Spanish children were not collected, since at age 7 they already behaved adult-like.

In Version 2 of the SET and in the PST data from 5-6-year-old children (and adults) were collected, as previous work has shown that 5-year-olds differ systematically from adults in the way they interpret sentences containing a universal quantifier and a negative operator (Musolino 1998; Musolino et al. 2000).

For the experiments carried out in Spanish, monolingual speakers of Spanish (children and adults) were recruited in Gasteiz (Araba), Iruña and Lizarra (Navarre), where the percentage of Basque native speakers was 22,46% and 12,5%, respectively, when the data were collected.[16] For the experiments carried out in Basque, Basque-dominant Basque-Spanish bilingual speakers (children and adults) were recruited in Gasteiz (Araba), Ordizia, Ibarra and Orereta (Gipuzkoa), where the percentage of Basque native speakers was 22,46%, 57,2%, 65,14% and 37,78%, respectively, when the data were collected.[17] It is important to highlight that today there are no monolingual speakers of Basque, thus all Basque native speakers participating in this work are bilinguals and have at least certain knowledge of Spanish. This is the reason for conducting the Bilingual study (see Chapter 7).

Very few participants were excluded, whose data weren't eventually included in the present study (cases in which the dominant language at home was a different one from the target language of the experiment).

[16] Data from 2011; source: Instituto de Estadística de Navarra (the Navarre Institute of Statistics).
[17] Data from 2011; source: EUSTAT.

As regards the Bilingual study, Version 1 of EXPERIMENT 1 was conducted with three groups of 5-to-6-year-old children: a Basque dominant Spanish-Basque bilingual group (n=13) was tested in its two languages, as well as a Spanish monolingual group (n=14) and a L1 Basque group (n=20), in order to (1) know their knowledge about the semantic-pragmatic meaning of the quantifiers *batzuk* and *algunos* 'some' and to (2) compare (i) bilinguals' interpretations with those of monolinguals and (ii) bilinguals' interpretations in their two languages. Their results were also compared to a group of Spanish native controls (n=10) and a group of Basque native controls (n=17).

## 3.5 PREDICTIONS

Based on the literature on quantification described in Chapter 2, and the hypotheses and research questions formulated in section 3.1, our predictions are the following:

**PREDICTION 1:** SEMANTICALLY MORE COMPLEX QUANTIFIERS (QS) WILL BE ACQUIRED LATER:

- **PREDICTION 1A:** PARTIAL QS WILL BE ACQUIRED LATER THAN TOTAL QS

We expect L1Spanish and L1Basque children to better comprehend the total quantifiers *todos* for Spanish and *guztiak* for Basque − which refer to the totality of the potential reference set − than the partial quantifiers *algunos* for Spanish and *batzuk* for Basque − whose reference set is a portion of the potential reference set, based on previous literature (Hanlon 1988; Katsos et al. 2016; a.o.).

- **PREDICTION 1B:** PROPORTIONAL QS WILL BE ACQUIRED LATER THAN PARTIAL QS.

We expect children to have fewer difficulties comprehending the partial quantifiers *algunos* for Spanish and *batzuk* for Basque, than comprehending the proportional quantifiers *la mayoría* for Spanish and *gehienak* for Basque (see Hackl 2009; Pietroski et al. 2009; Katsos et al. 2016).

- **PREDICTION 1C:** MONOTONE DECREASING QS WILL BE ACQUIRED LATER THAN MONOTONE INCREASING ONES

We expect children's rates of comprehension to be higher with monotone increasing quantifiers (*todos* and *algunos* for Spanish, and *guztiak* and *batzuk* for Basque) than with monotone decreasing ones (*no todos* and *algunos no* for Spanish, and *guztiak ez* and *batzuk ez* for Basque) (see Just & Carpenter 1971; Katsos et al. 2016).

**PREDICTION 2:** CHILDREN WILL HAVE MORE DIFFICULTIES DETECTING VIOLATIONS OF INFORMATIVITY THAN VIOLATIONS OF TRUTH-CONDITIONS

We expect children to have fewer difficulties detecting true/false-and-informative sentences than detecting true-but-under-informative ones, in line with previous literature on early language acquisition (Noveck 2001, 2004; Guasti et al. 2005; Papafragou & Musolino 2003; a.o.).

**PREDICTION 3:** CHILDREN WILL DERIVE FEWER SIS THAN ADULTS

Taking into account that adults show no difficulties in detecting violations of truth-conditions and informativeness (see Guasti et al. 2005; Noveck 2001; Papafragou & Musolino 2003), we predict that Spanish and Basque adults will have no difficulties in detecting neither violations of truth-conditions nor of

informativeness. Moreover, based on the fact that children have difficulties to detect violations of informativeness (Noveck 2001, 2004; a.o.), contrary to adults, we expect to find differences between the comprehension pattern of Spanish/Basque adults and the one by Spanish/Basque children in that respect. That is, we predict that children will derive fewer SIs than adults.

**PREDICTION 4:** THE LINGUISTIC PROFILE OF THE CHILDREN WILL NOT AFFECT THE DERIVATION OF SIS

The few studies carried out on the derivation of SIs with bilingual children as compared to monolingual children have given evidence for different results. Siegal et al. (2017) found enhanced pragmatic abilities on behalf of bilingual children, whereas other studies (Antoniou et al. 2013; Syrett et al. 2017) have attested no bilingual advantage. We predict that the linguistic profile of the children will not affect the derivation of SIs, as there is no solid evidence in favour of a bilingual (nor a monolingual) advantage.

**PREDICTION 5:** THE ORDER BETWEEN UNIVQS & NEG WILL DETERMINE THE RESULTING INTERPRETATION

According to the "Observation of Isomorphism" (Musolino 1998; Musolino et al. 2000), "children's semantic scope coincides with overt syntactic scope", thus we predict L1Spanish and L1Basque children to interpret overt Neg-UnivQ as Neg having scope over UnivQ and to interpret overt UnivQ-Neg as UnivQ having scope over Neg.

**PREDICTION 6:** THE KIND OF TASK WILL HAVE AN EFFECT ON THE UNIVQ-NEG / NEG-UNIVQ INTERPRETATION

The methodology employed can influence on the outcome of the experiment (see Featherston 2005; Schmitt & Miller 2010; a.o.), so we expect to

find outcome differences between the Sentence Evaluation Task (SET - Version 2 of EXPERIMENT 1) and the Picture Selection Task (PST). While in the SET participants evaluate if they accept or reject a specific reading, in the PST they can express their preference for one reading over the other.

# CHAPTER 4: POSITIVE QUANTIFIERS

In this chapter the results obtained in the FLA study with the positive quantifiers from Version 1 of EXPERIMENT 1 are presented (*todos* 'all', *la mayoría* 'most' and *algunos* 'some' in Spanish, and *guztiak* 'all', *gehienak* 'most' and *batzuk* 'some' in Basque), as part of the scale {all, most, some}.

In Chapters 4 and 5, HYP1 and HYP2, RQ1 and RQ2, and Predictions 1 to 3 are tested, repeated here for the reader's convenience:

**HYPOTHESES:**

HYP1. Children show a gradual acquisition of the semantic properties of quantifiers (totality, partiality, proportionality, monotonicity) (Katsos et al. 2012, 2016).

HYP2. Children acquire the semantic properties of quantifiers before the pragmatic ones (Noveck 2001, 2004; Katsos et al. 2012, 2016).

**RESEARCH QUESTIONS:**

RQ1. How and when do Basque and Spanish children acquire the semantic properties of positive and negated quantifiers (Katsos et al. 2012, 2016)?

RQ2. Which factors influence on the acquisition of the pragmatic properties of quantifiers? Do we observe 'a pragmatic deficit stage' (Noveck 2001) or is there a lack of knowledge about the scalar items in question ('Scalar Approach'; Barner et al. 2011)?

**PREDICTIONS:**

PREDICTION 1: SEMANTICALLY MORE COMPLEX QS WILL BE ACQUIRED LATER:

- PREDICTION 1A: PARTIAL QS WILL BE ACQUIRED LATER THAN TOTAL QS
- PREDICTION 1B: PROPORTIONAL QS WILL BE ACQUIRED LATER THAN PARTIAL QS.
- PREDICTION 1C: MONOTONE DECREASING QS WILL BE ACQUIRED LATER THAN MONOTONE INCREASING ONES

PREDICTION 2: CHILDREN WILL HAVE MORE DIFFICULTIES DETECTING VIOLATIONS OF INFORMATIVITY THAN VIOLATIONS OF TRUTH-CONDITIONS

PREDICTION 3: CHILDREN WILL DERIVE FEWER SIS THAN ADULTS

## 4.1 SENTENCE EVALUATION TASK (EXPERIMENT 1- VERSION 1)

As observed in Chapter 2, the issue of the interpretation of natural quantifiers in L1 acquisition has been a relevant topic in the literature with languages such as English, French or Greek (see Noveck 2001, 2004; Guasti et al. 2005; Papafragou & Musolino 2003; Barner et al. 2011; a.o.). Specifically, the interpretation of under-informative quantificational constructions and the derivation of SIs have been of much interest since the pioneering work by Grice (1975, 1989). However, there are no studies which explain that acquisition process by children and the interpretations that adults obtain neither for Spanish nor for Basque, so the present study comes to fill this gap.

### 4.1.1 Specific Research Questions

This experiment aims to test the following specific research questions:

1) How and when do 4- to 7/9-year-old L1Spanish and L1Basque children comprehend

   (a) *todos* for Spanish and *guztiak* for Basque,
   (b) *algunos* for Spanish and *batzuk* for Basque, and
   (c) *la mayoría* for Spanish and *gehienak* for Basque?

2) How do L1 Spanish and L1 Basque adults comprehend those quantifiers?

3) Are there similarities/differences between age groups? And between languages? Can we observe a specific developmental pattern?

### 4.1.2 Specific Predictions

Based on the literature reviewed on quantification in Chapter 2, our specific predictions for the comprehension and acquisition of quantifiers are the following:

1) 4- to 7/9-year-old L1Spanish and L1Basque children:

   a) will better comprehend the quantifiers *todos* for Spanish and *guztiak* for Basque (which refer to the totality of the potential reference set), than the quantifiers *algunos* for Spanish and *batzuk* for Basque (whose reference set is a portion of the potential reference set) (see Hanlon 1988).

   b) children will have fewer difficulties comprehending *algunos* for Spanish and *batzuk* for Basque, than comprehending *la mayoría* for Spanish and *gehienak* for Basque (see Hackl, 2009; Pietroski et al., 2009; Katsos et al., 2012 ).

c) children will have fewer difficulties detecting true/false-and-informative sentences than detecting true-but-under-informative ones (see Noveck 2001, 2004; Guasti et al. 2005; Papafragou & Musolino 2003; a.o.).

Predictions (a), (b) and (c) could be summarized as follows:[18]

*todos* > *algunos* > *la mayoría* (Spanish)
*guztiak* > *batzuk* > *gehienak* (Basque)

2) Taking into account that adults show no difficulties in detecting violations of truth-conditions and informativeness (see Guasti et al. 2005; Noveck 2001; Papafragou & Musolino 2003), we predict that Spanish and Basque adults will have no difficulties in detecting neither violations of truth-conditions nor of informativeness.

3) Based on the fact that children have difficulties to detect violations of informativeness (Noveck 2001, 2004), contrary to adults, we expect to find differences between the comprehension pattern of Spanish/Basque adults and the one by Spanish/Basque children in that respect.

### 4.1.3 Method

In Table 3 (information taken from Table 1) all the combinations with the positive quantifiers, the meanings tested and the possible contexts are presented, together with the target responses, the number of items (per meaning and quantifier) and a description.

[18] '>' in this case meaning "earlier comprehended".

| Quantifier | Condition | Nº of Items | Arrangement | Target Response | Description |
|---|---|---|---|---|---|
| ***todos/ guztiak*** **'all'** | SC | 3 | 5/5 | Right | Semantically true |
| | | 3 | 2/5 | Wrong | Semantically false |
| | | 3 | 2/5 | Wrong | Semantically false |
| ***algunos batzuk*** **'some'** | PC | 6 | 5/5 | Wrong | Pragmatically infelicitous (under-informative) |
| | SC | 3 | 2/5 | Right | Semantically true |
| | | 3 | 0/5 | Wrong | Semantically false |
| ***la mayoría/ gehienak*** **'most'** | PC | 6 | 5/5 | Wrong | Pragmatically infelicitous (under-informative) |
| | SC | 3 | 4/5 | Right | Semantically true |
| | | 3 | 2/5 | Wrong | Semantically false |

Table 3: SET (Version 1) – Positive Quantifiers

### 4.1.4 Participants

A total of 158 children and adults participated in the study divided by language profile (L1Spanish or L1Basque) and age (see Tables 4 and 5).

| | 4-year-olds | 5-year-olds | 6-year-olds | 7-year-olds | Adults |
|---|---|---|---|---|---|
| **L1 Spanish (n=73)** | mean: 4;4<br>range <3;8-4;8><br>(n=17) | mean: 5;4<br>range <5;0-5;9><br>(n=21) | mean: 6;5<br>range <6;2-6:9><br>(n=10) | mean: 7;1<br>range <7;0-7;4><br>(n=13) | (n=12) |

Table 4: Participants in the Spanish Experiment (SET – Version 1)

| | 4/5-year-olds | 6-year-olds | 7-year-olds | 8/9-year-olds | Adults |
|---|---|---|---|---|---|
| **L1 Basque (n=85)** | mean: 4;5 range <4;0-4;9> (n=21) | mean: 6;5 range <6;0-6;9> (n=17) | mean: 7;4 range <7;2-7;8> (n=20) | mean: 8;4 range <8;0-8;9> (n=17) | (n=10) |

Table 5: Participants in the Basque Experiment (SET – Version 1)

The data from the Spanish children were collected in Iruña (Nafarroa) and in Vitoria-Gasteiz (Araba). The children from Iruña are monolingual Spanish-speakers, their parents are monolingual Spanish-speakers and they have a monolingual environment of Spanish. The educational model followed at their schools is the Model A (see section 3.3 for a description of the three models). The children from Vitoria-Gasteiz are successive bilinguals of Spanish and Basque. Although the educational model followed at their school is the Model B, their dominant language is Spanish. In fact, their parents are monolingual Spanish-speakers and the children always communicate in Spanish at home (with their parents and grandparents), at school (in the playground) and out of school with friends.

The data from the Basque children were collected in Ordizia and Ibarra (Gipuzkoa). All the 75 Basque children are bilingual speakers of Basque and Spanish, but their dominant language is Basque. The educational model followed at their schools is the Model D. They always communicate in Basque both at home and at school, and at least one of their parents is a native speaker of Basque.

In addition to the 61 L1 Spanish children and the 75 L1 Basque children, two adult control groups were tested as well for reference: 12 native Spanish-speakers from Nafarroa and Araba, as well as 10 native Basque-speakers from Araba and Gipuzkoa (Basque-Spanish bilinguals).

### 4.1.5 Results

It must be noted that the overall attitude of all the participants was a collaborative and an active one. In fact, all the participants completed the experimental task in one session. However, a common characteristic among the majority of the children is that they became more involved in the task as the experiment advanced.

The results obtained in this study will be described in three different ways, in order to control the effects of age, meaning tested and the quantifiers themselves:

1) Regarding the development across **age-groups**.
2) Regarding the **meaning** tested: Semantic Meaning (SM) / Pragmatic Meaning (PM).
3) **Order** of acquisition of the quantifiers.

#### 4.1.5.1 Spanish experiment (SET)

As explained in section 3.2.1.1, both the SM and the PM of the quantifiers were tested. For the PM, the Target Response (TR) is to reject the sentences (to say 'Wrong'), based on the fact that the sentences are pragmatically infelicitous in the contexts presented on the screen. With the SM, for half of the sentences the TR is to accept the sentences (to say 'Right'), taking into account that the truth-values of the sentences are satisfied by the context in question; for the other half of the sentences, the TR is to reject the sentences, based on the fact that the truth-values of the sentences are not satisfied by the context. Along this and next sections (Chapters 4 & 5), Graphs indicate the rates of the TR that participants obtain with *todos*, *algunos* and *la mayoría* in the SM and the PM conditions.

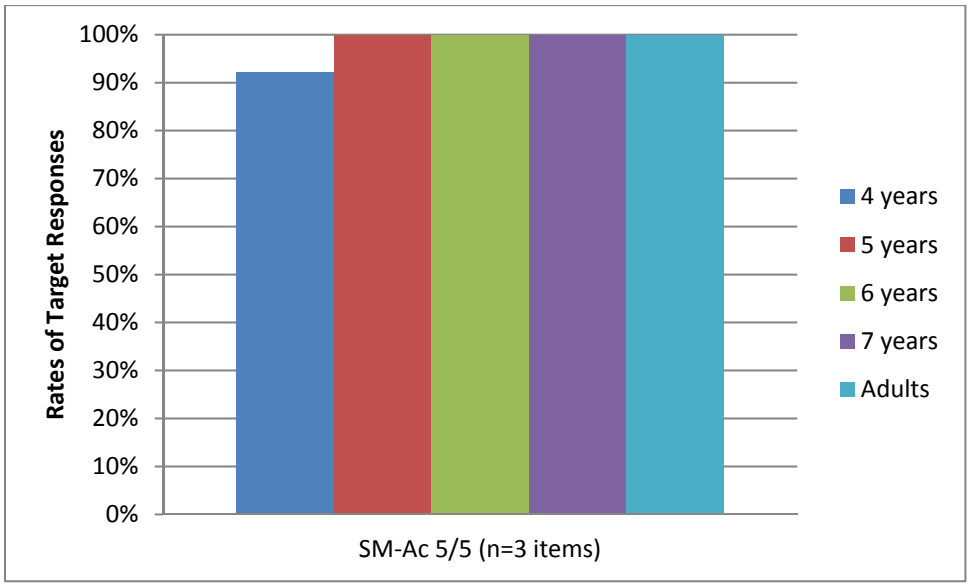
The statistical analysis was carried out with the SPSS program and 80% was taken as an indicator of a target-like behaviour (this applies for all the data presented in this dissertation).

4.1.5.1.1 The development across age groups

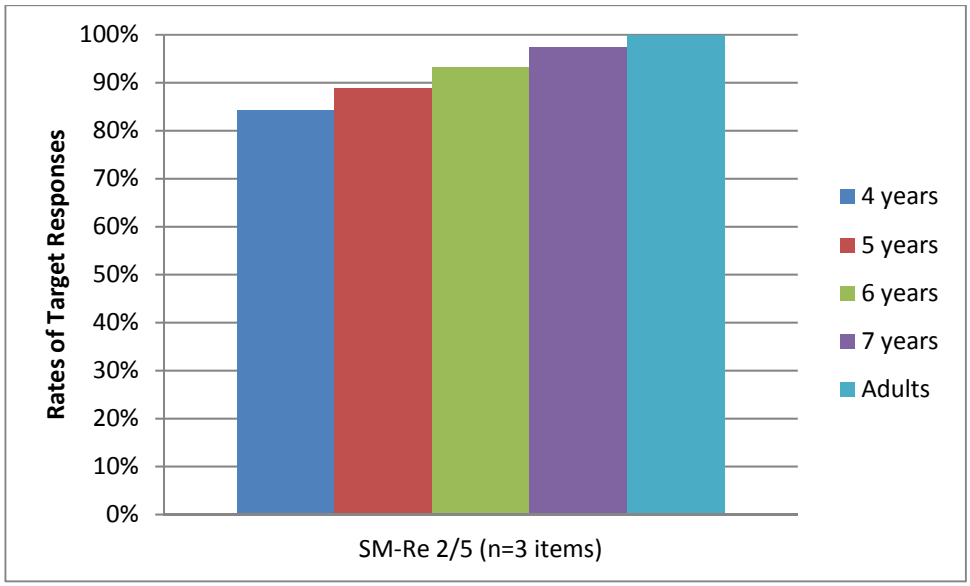
4.1.5.1.1.1 *Todos* 'all'

L1 Spanish children obtain at ceiling percentages of target responses in all age groups with the quantifier *todos* in the 5/5 and the 2/5 contexts, both when the sentence should be accepted (shown as "Ac" in graphs) as well as rejected (shown as "Re" in graphs). In fact, in the 5/5 context, all the scores go up from 92% of target responses, and in the 2/5 context, all the scores go up from 84% of target responses (see Graphs 1 and 2).

These results indicate that L1 Spanish children do not show any difficulties when judging if the truth-conditions of the quantifier *todos* are satisfied or not, thus they know the SM of this quantifier already at age 4. It is worth mentioning that the quantifier *todos* as well as *ninguno* are only tested for their SM, as these two quantifiers cannot be tested in an under-informative (PM) condition.




Graph 1: Acceptance of *todos* 'all' in 5/5 - L1Spanish children and adults

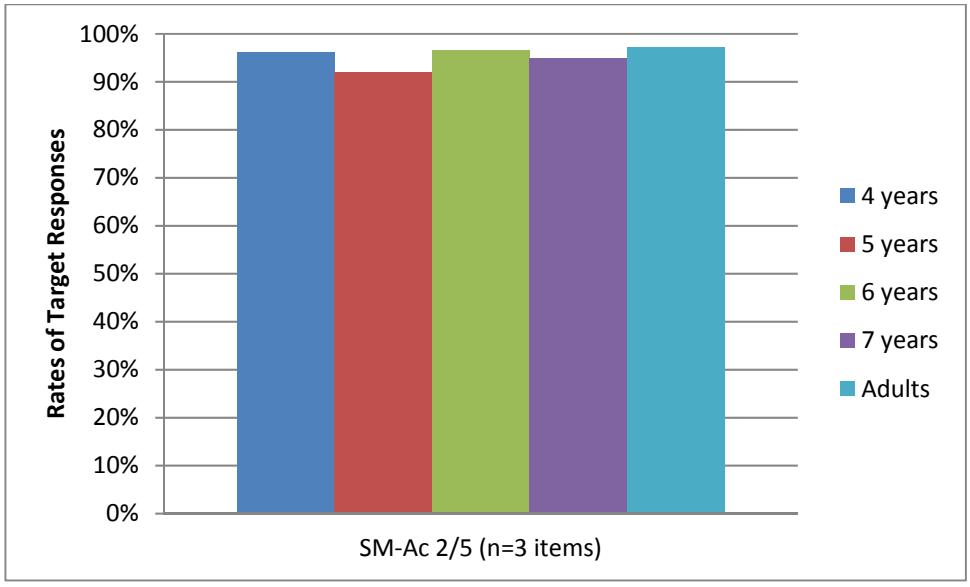



Graph 2: Rejection of *todos* 'all' in 2/5 – L1Spanish children and adults

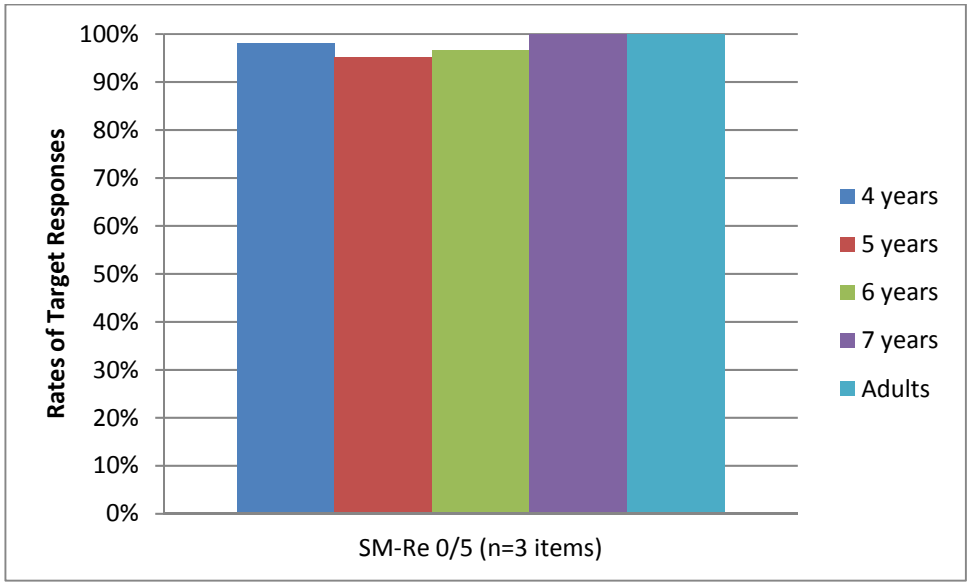
4.1.5.1.1.2 *Algunos* 'some'

With the quantifier *algunos*, however, a relevant difference between the SM (see Graphs 3 and 4) and the PM (see Graph 5) can be observed. For the SM children obtain very high percentages of target responses in all ages, both in the 2/5 and in the 0/5 contexts. In fact, all the scores go up from 92% of target

responses (see Graphs 3 and 4), what indicates that L1 Spanish children have no difficulties to judge if the truth-conditions of the quantifier *algunos* are satisfied or not, thus they know its SM by age 4.



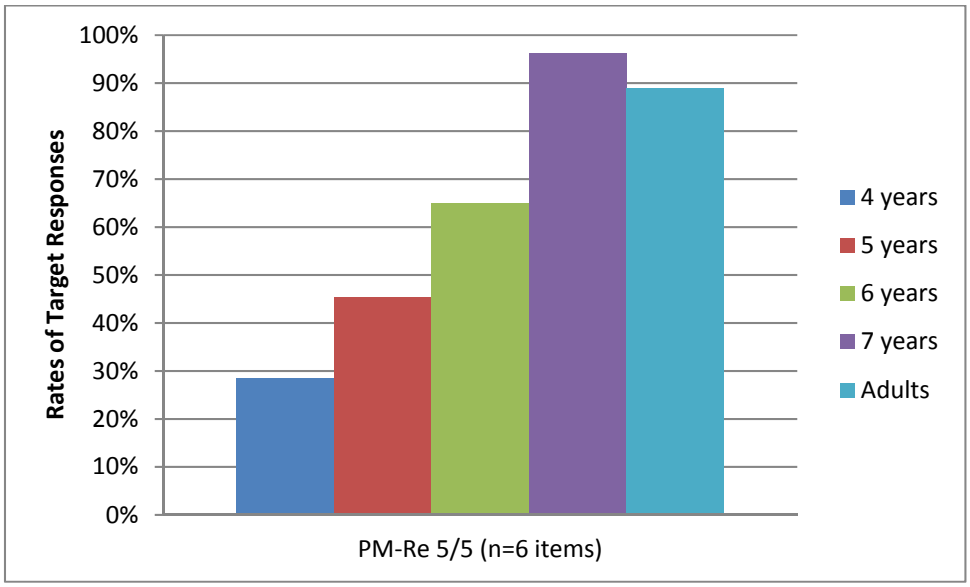

Graph 3: Acceptance of *algunos* 'some' in 2/5 – L1Spanish children and adults




Graph 4: Rejection of *algunos* 'some' in 0/5 – L1Spanish children and adults

In Graph 5, where the results for the PM of *algunos* are plotted, a gradual increase in the percentages from the 4-year-old children to the 7-year-old

children can be observed (28%, 45%, 65% and 96% of target responses, respectively). There is a significant effect of age ($F_{4,68}$=9.700, p=0.000, sig). In particular, post-hoc pairwise comparisons with a Scheffe test (since the group sizes are different), revealed that 7-year-old children outperform significantly both 4-year-old ones (p=0.000, sig.) and 5-year-old ones (p=0.005, sig.). These results suggest that the older the children are, the higher their tendency to reject under-informative sentences with *algunos*, and thus to know its PM.

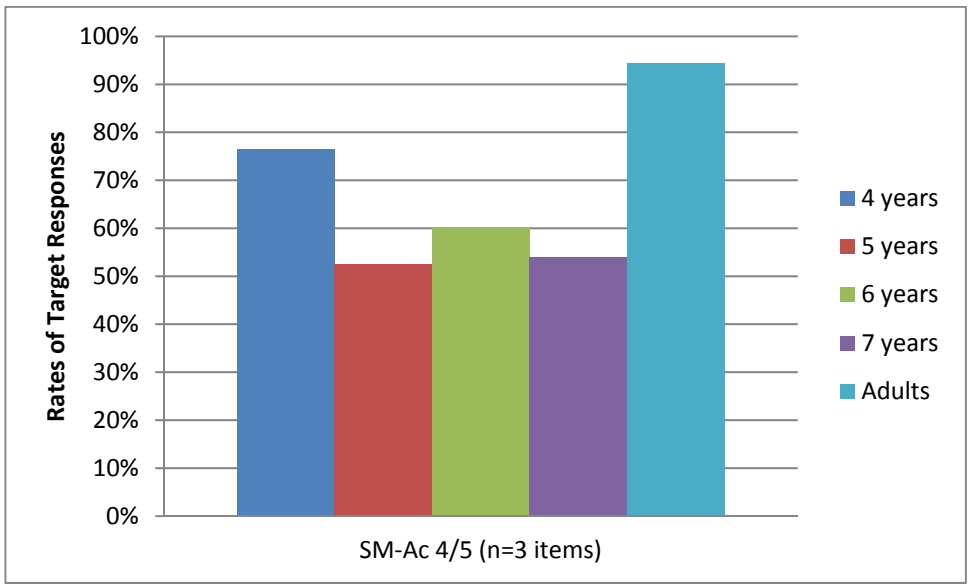



Graph 5: Rejection of *algunos* 'some' in 5/5 – L1Spanish children and adults

4.1.5.1.1.3 *La mayoría* 'most'

With the quantifier *la mayoría*, the rates of target responses are quite low in general and we can observe as well some differences between the SM and the PM (see Graph 6). In fact, for the SM, in the 4/5 context children obtain between 52% and 76% of target responses. Within this condition, 5-, 6- and 7-year-old children give at chance answers (t(20)=0,234; p=0,817 / t(9)=0,678; p=0,515 / t(12)=0,288; p=0,778, respectively), since there is no significant difference between their mean rates (52%, 60% and 54%) and the chance level 50%.

Although 4-year-old children outperform the older groups in this condition (mean=76%), no effect of age was found ($F_{3,57}$=1.042, p=0.381) between the child groups. In particular, post-hoc pairwise comparisons with a Scheffe test revealed that there are no significant differences between 4- and 5-year-old children (p=0.446), between 4- and 6-year-old ones (p=0.838) and between 4- and 7-year-old ones (p=0.602).

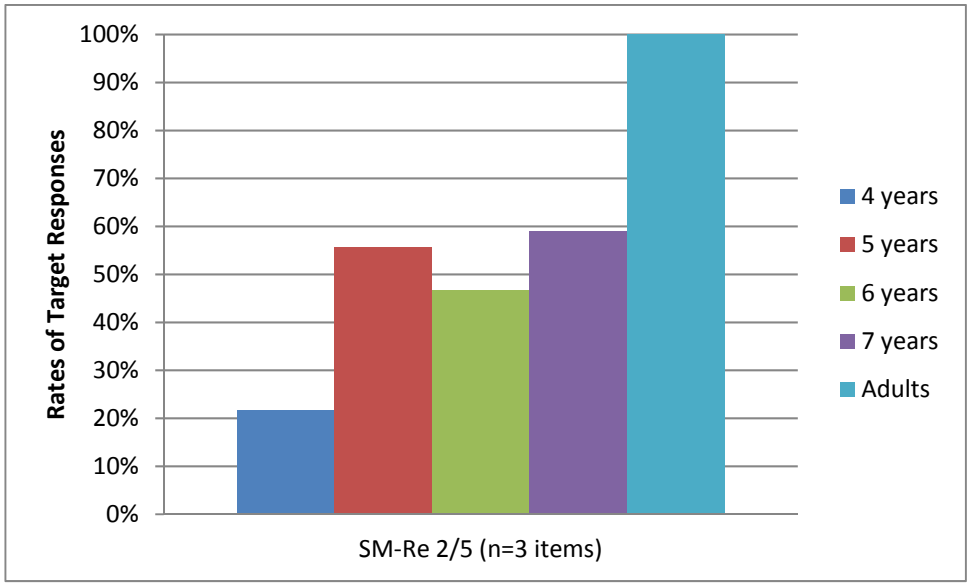



Graph 6: Acceptance of *la mayoría* 'most' in 4/5 – L1Spanish children and adults

In the 2/5 context children obtain between 21% and 59% of target responses (see Graph 7). Within this condition, 5-, 6- and 7-year-old children give at chance answers (t(20)=0,638; p=0,531 / t(9)=-0,221; p=0,830 / t(12)=0,712; p=0,490, respectively), since there is no significant difference between their mean rates (56%, 47% and 59%) and the chance level 50% (see Graph 7).

Though 4-year-old children obtain a lower mean rate (22%) than the older groups in this condition, a Scheffe test revealed that there are no significant differences between 4- and 5-year-old children (p=0.095), between 4- and 6-year-old children (p=0.491) and between 4- and 7-year-old children (p=0.108).

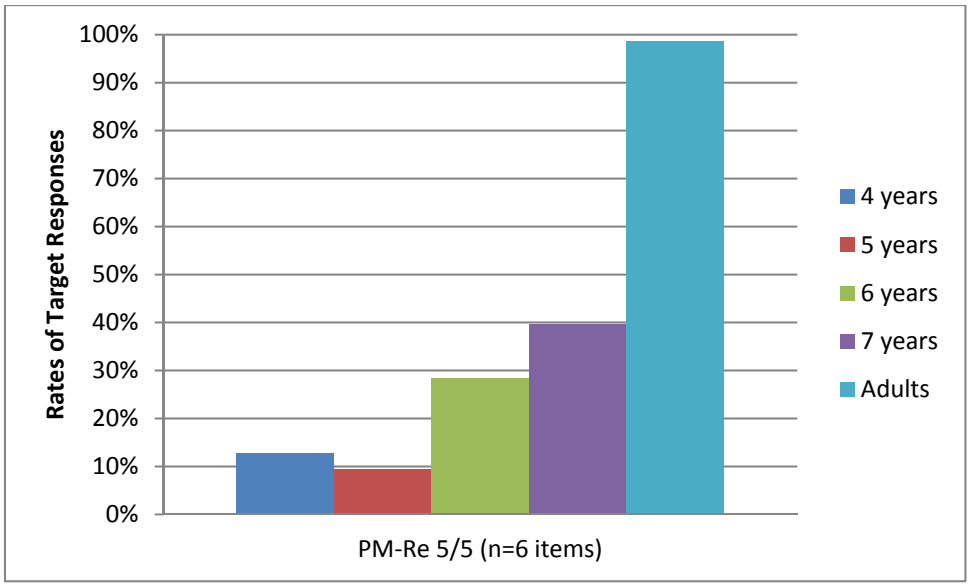
The above results indicate that L1Spanih children do not grasp the SM of *la mayoría*, nor at age 7. It is worth mentioning as well that L1Spanih children obtain more target-like scores with the 4/5 context than with the 2/5 context, that is, they accept semantically correct sentences with *la mayoría* in higher rates than reject semantically incorrect sentences with this quantifier.




Graph 7: Rejection of *la mayoría* 'most' in 2/5 – L1Spanish children and adults

In the PC condition, children obtain very low rates of target responses; in fact, all scores are below 40% (i.e. between 9% and 39%; see Graph 8). There is a significant effect of age ($F_{3,57}$=5.929, p=0.001, sig). In fact, the Scheffe test showed that 7-year-old children differ significantly from both 4-year-old ones (p=0.020, sig.) and 5-year-old ones (p=0.004, sig.). Nevertheless, an inferential t-test revealed that 6- and 7-year-old children give at chance answers (t(9)=-2,177; p=0,057 / t(12)=-1,145; p=0,275, respectively), since there is no significant difference between their mean rates (28% and 39%) and the chance level 50%.

This lack of age effect indicates that L1Spanish children do not know the PM of *la mayoría* still at age 7.




Graph 8: Rejection of *la mayoría* 'most' in 5/5 – L1Spanish children and adults

Summing up, regarding the comprehension of each quantifier by L1 Spanish children and adults the following can be observed:

(a) Most 4-to-7-year-old children know the SM of the quantifier *todos*.

(b) With the quantifier *algunos*:

(i) Children know its SM by age 4.

(ii) A gradual increase in the rejection of under-informative sentences with *algunos* from 4- to 7-year-old children can be observed. This means that the older the children are, the higher the tendency to derive SIs (and thus to comprehend the PM of this quantifier).

(c) With the quantifier *la mayoría*:

(i) Children show more difficulties when recognizing that its truth-values are false, than when they are true. Therefore, they have not fully acquired its SM.

(ii) Children do not reject under-informative sentences (do not know the PM of *la mayoría*), nor at the age of 7. This means that they are not deriving SIs with this quantifier.

4.1.5.1.2 Semantic meaning vs. pragmatic meaning

As seen in the previous section, all the quantifiers (except *todos* and *ninguno*) are tested for two meanings: their Semantic Meaning (SM), and their Pragmatic Meaning (PM). To test their SM, for half of the sentences (3 out of 6 with each quantifier) the Target Response (TR) is to accept the sentences (to say 'Right', taking into account that the truth-values of the sentences are satisfied by the context) and for the other half of the sentences (3 out of 6 with each quantifier) the TR is to reject the sentences (to say 'Wrong', taking into account that the truth-values of the sentences are not satisfied by the context). For the PM, the TR is to reject the sentences, based on the fact that the sentences are presented in a pragmatically infelicitous context (see Grice 1975, 1989).

Therefore, when testing the PM of the quantifiers, participants can react in two possible ways: they can accept a sentence like (37a) in a context where 'all the apples are in the boxes' (i.e. a 5/5 context; see Figure 10, repeated from Figure 4), deriving a (37b) reading; or they can reject the sentence, following pragmatics, thus making a SI, and deriving a (37c) reading.

(37) a. *Some apples are in the boxes*
b. *All the apples are in the boxes*
c. *Not all the apples are in the boxes*

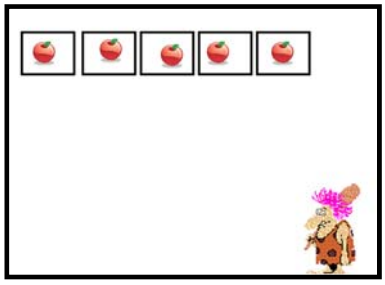
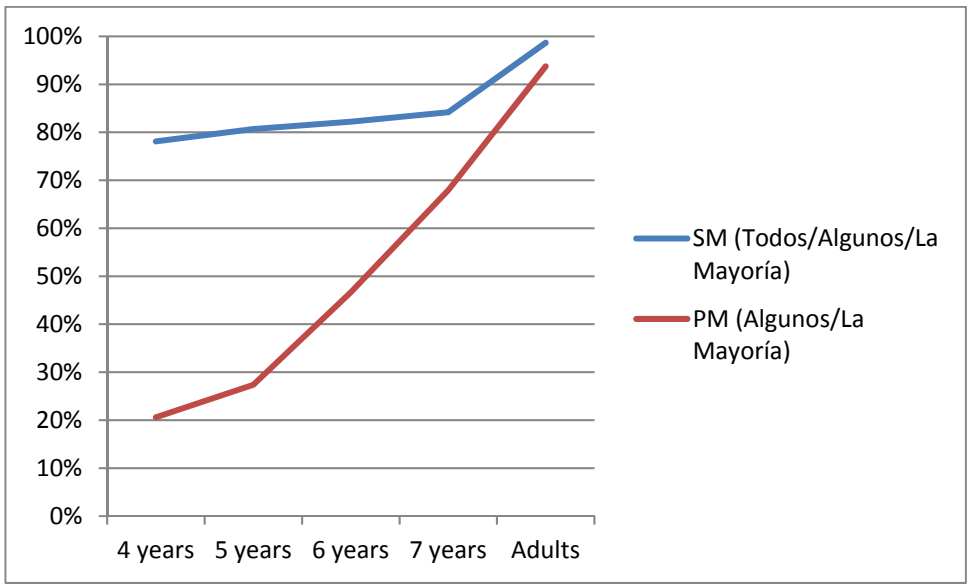


Figure 10: 5/5 context

The rejection of an under-informative quantificational construction is compatible with the "Cooperative Principle" (Grice 1975, 1989), and more specifically with the first submaxim of the "Quantity Principle" (which states that a sentence has to be as informative as possible). When exposed to (37a) in a context where 'all the apples are in the boxes', the participant should understand

that the puppet does not have enough information to say (37b) (following this way the "Quantity Principle"), and that what should be inferred is (37c).

In Graph 9 the mean rates with the SM (of *todos*, *algunos* and *la mayoría*) and the PM (of *algunos* and *la mayoría*) that L1Spanish children and adults obtain are plotted:




Graph 9: Mean rates with SM and PM – Positive Quantifiers – L1Spanish children and adults

The increasing rates of target responses observed in Graph 9 suggest that the knowledge of both the SM and the PM gradually increases as the participants get older. However, while the results with the SM are high already at age 4 (78% of TR), the results with the PM are low at age 4 (21% of TR) and they increase gradually till age 7, when children obtain a 68% of TR.

The observed pattern suggests the following:

(i) the evolution of the SM of positive quantifiers by L1Spanish children is different from the one of the PM.

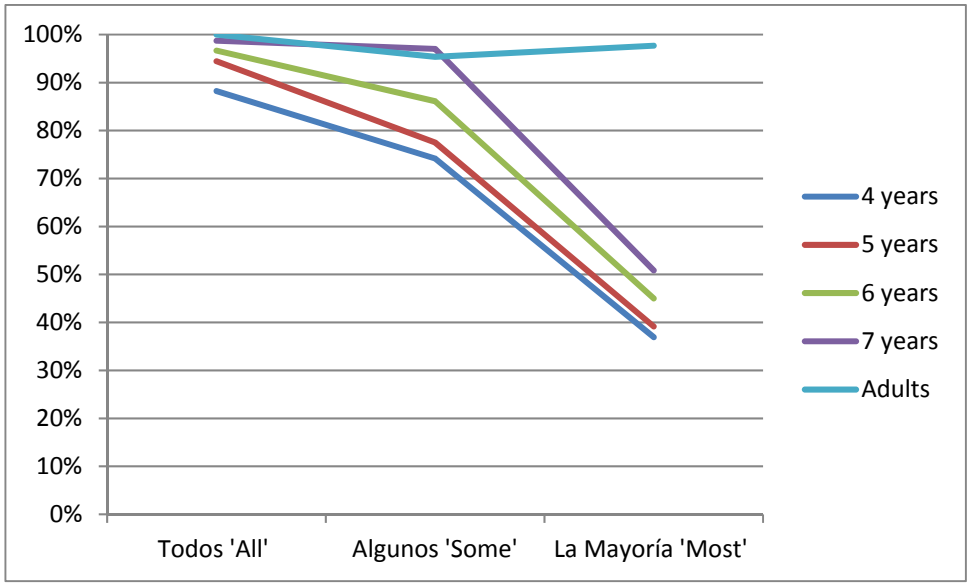
(ii) the SM of positive quantifiers is known by L1Spanish children by age 4 (except for *la mayoría*).

(iii) the PM of positive quantifiers is acquired gradually as children get older.

(iv) knowing the SM of a quantifier does not imply the knowledge of its PM.

4.1.5.1.3 Order of acquisition of the quantifiers

In Graph 10, the overall mean rates (SM + PM) with positive quantifiers (*todos*, *algunos* and *la mayoría*) obtained by L1Spanish children and adults are shown:




Graph 10: Overall mean rates with positive quantifiers (*todos* 'all', *algunos* 'some' and *la mayoría* 'most') – L1Spanish children and adults

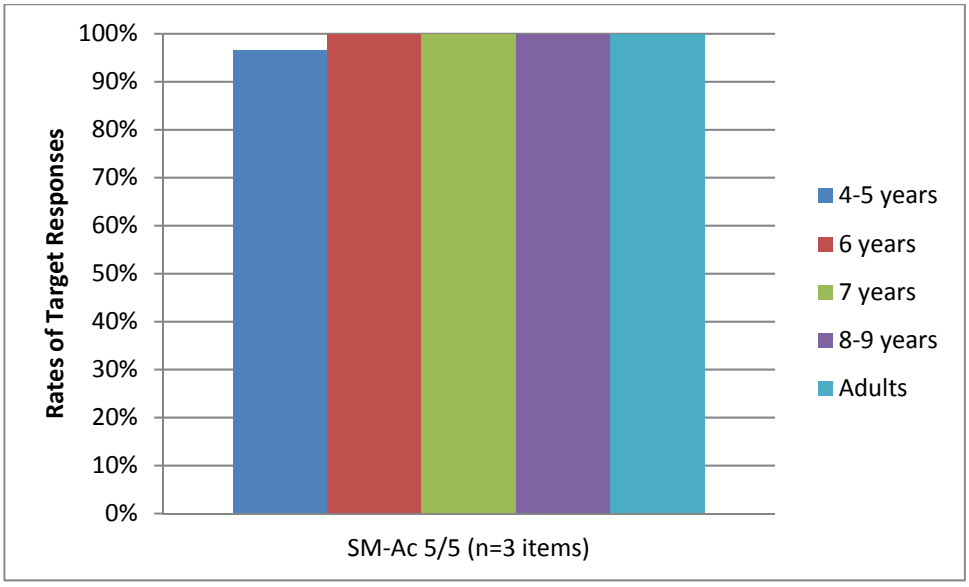
In Graph 10 it can clearly be seen that the quantifier which is acquired first is *todos*, with high target answers since age 4 (88%). It is followed by the quantifier *algunos*, with 74% of target answers at age 4. The quantifier with the lowest scores is *la mayoría*, with 51% of target responses still at age 7. The interesting fact about this pattern — *todos* > *algunos* > *la mayoría* — is that it is the same in all age groups.

4.1.5.2 Basque experiment (SET)

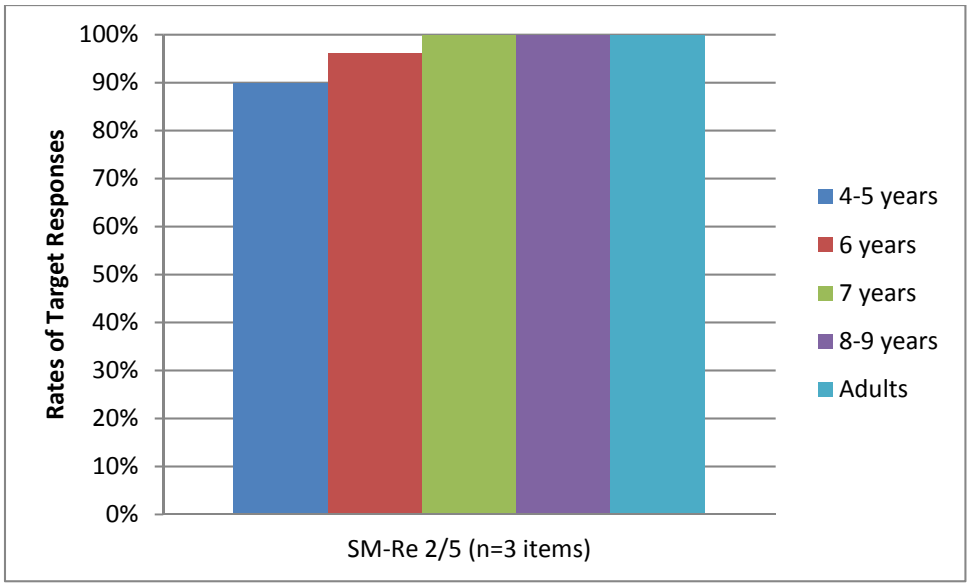
4.1.5.2.1 The development across age groups

4.1.5.2.1.1 *Guztiak* 'all'

L1Basque children obtain very high percentages of target responses in all ages with the quantifier *guztiak*, both in the 5/5 and in the 2/5 contexts. In fact, in the 5/5 context all the scores go up from 97% of target responses, and in the 2/5 context all the scores go up from 90% of target responses (see Graphs 11 and 12).



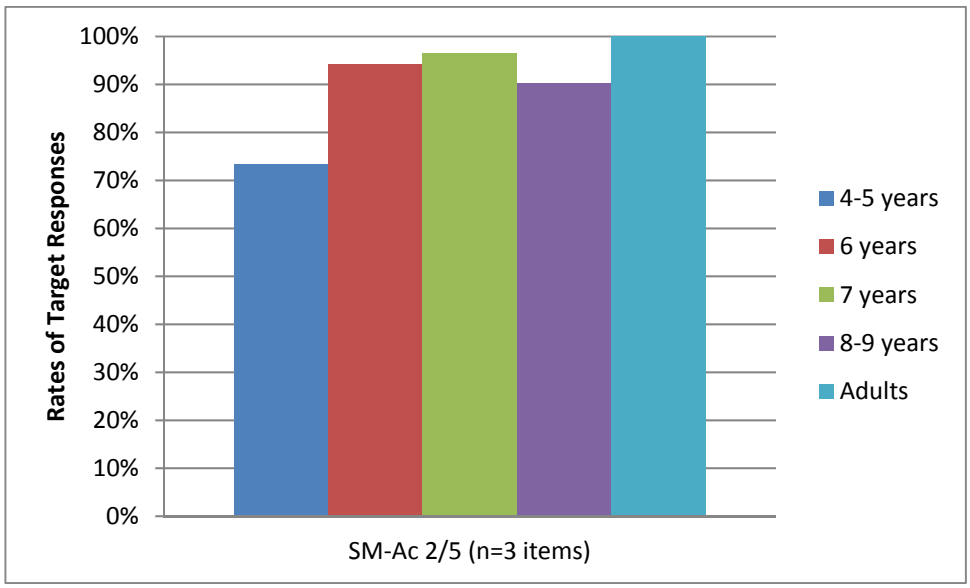

Graph 11: Acceptance of *guztiak* 'all' in 5/5 – L1Basque children and adults



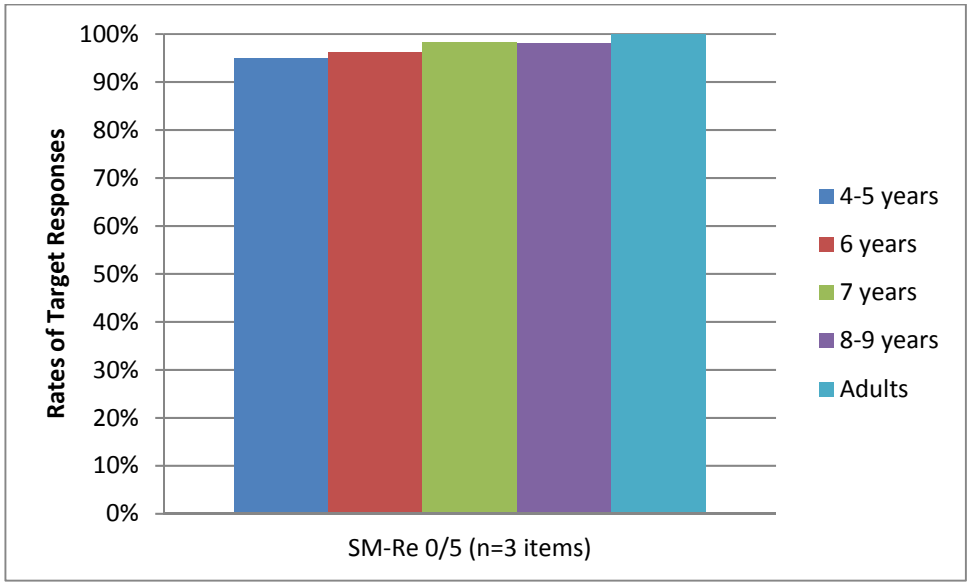

Graph 12: Rejection of *guztiak* 'all' in 2/5 – L1Basque children and adults

4.1.5.2.1.2 *Batzuk* 'some'

With the quantifier *batzuk*, as happened with L1Spanish children, a difference in the results obtained with the SM and PM can be observed. For the SM, children obtain high percentages of target responses in all ages, both in the 2/5 context (more than 73% of TR) and in the 0/5 context (more than 95% of TR) (see Graphs 13 and 14).




Graph 13: Acceptance of *batzuk* 'some' in 2/5 – L1Basque children and adults

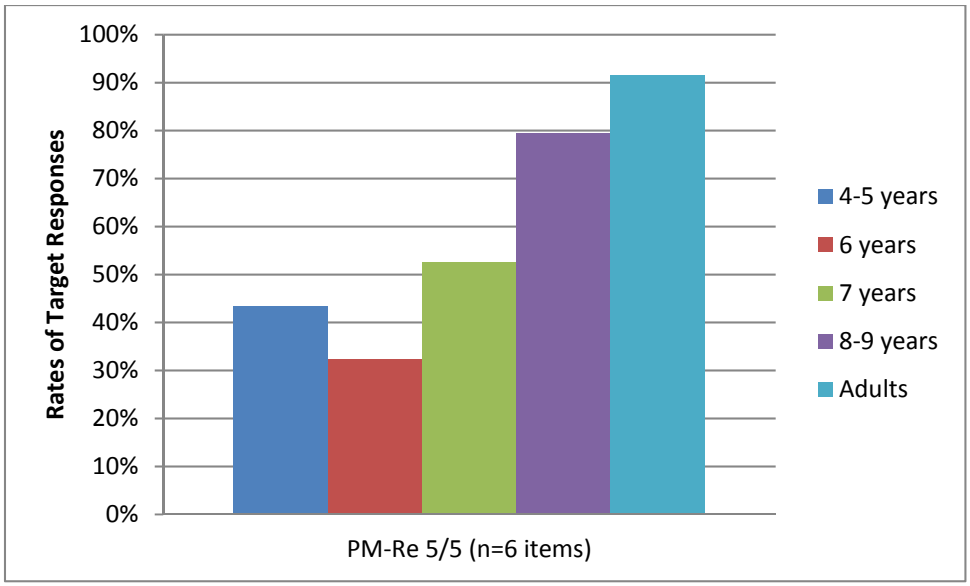



Graph 14: Rejection of *batzuk* 'some' in 0/5 – L1Basque children and adults

In Graph 15 it can be observed that their results for the PM of *batzuk* are quite low at age 7 (53% of TR), and it is not until L1Basque children are 8-9-year-old that they obtain a 79% of target responses. Within this condition, 4/5-, 6- and 7-year-old children give at chance answers (t(20)=-0,940; p=0,359 / t(16)=-1,629; p=0,123 / t(19)=0,264; p=0,795, respectively), since there is no significant difference between their mean rates (43%, 32% and 53%) and the chance level 50%. There is a significant effect of age ($F_{3,69}$=4.646, p=0.005, sig). In particular, post-hoc pairwise comparisons with a HSD Tukey test (since the group sizes are similar) revealed that 8/9-year-old children outperform significantly 4/5-year-old ones (p=0.030, sig.) and 6-year-old ones (p=0.004, sig.).

Therefore, these results indicate that even though at age 4-5 they have already acquired the SM of *batzuk*, they do not grasp its PM till age 8-9.[19]

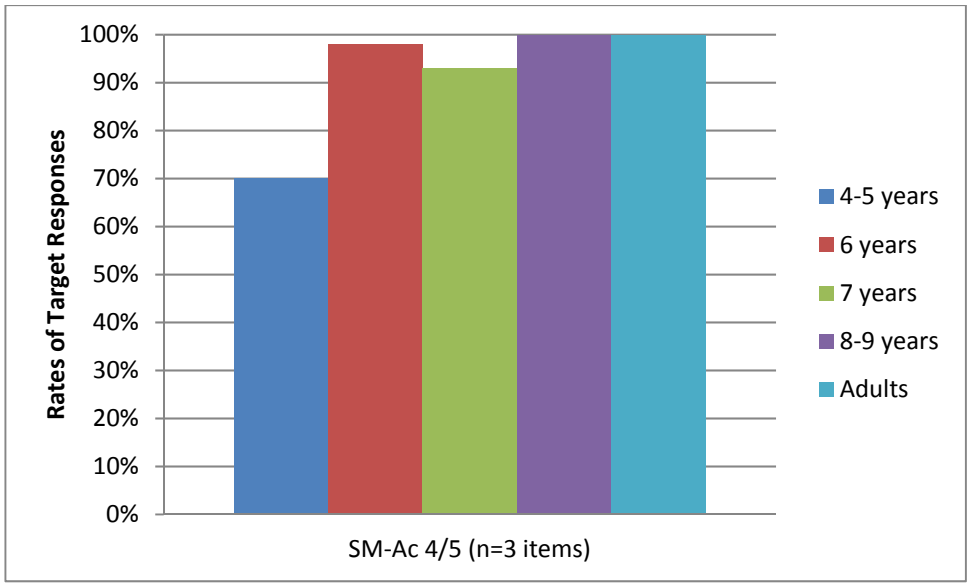
[19] The fact that L1Basque children didn't know the PM of *batzuk* even at age 7 (in comparison to the 7-year-old L1Spanish children, who obtained a 96% of target responses for the PM of *algunos*) led us to conduct the experiment with 8-9-year-old L1Basque children, so as to know when was the exact age of acquisition of the PM of *batzuk*.




Graph 15: Rejection of *batzuk* 'some' in 5/5 – L1Basque children and adults

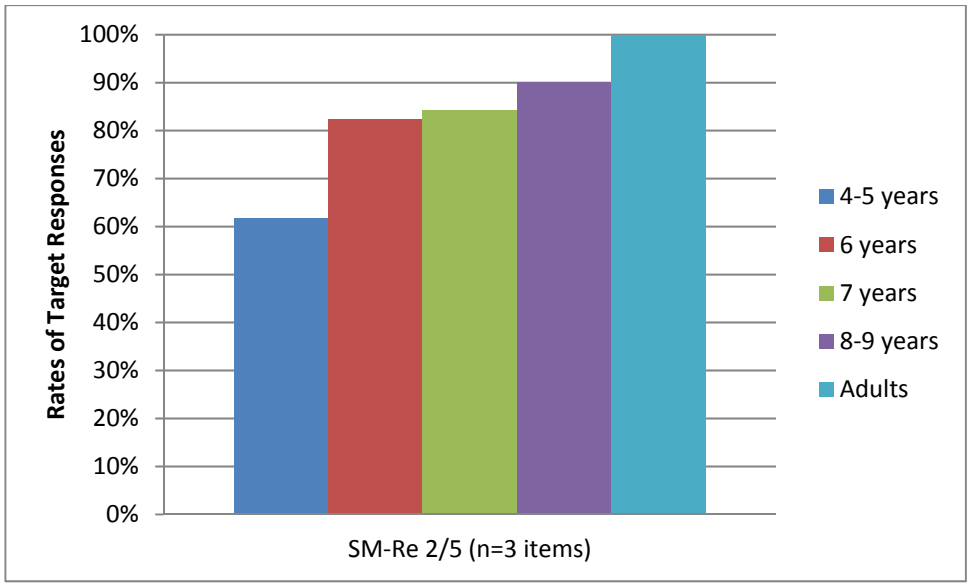
4.1.5.2.1.3 *Gehienak* 'most'

With the quantifier *gehienak*, different results between the SM and the PM can be observed. In fact, for the SM, in the 4/5 context children obtain high percentages of target responses (i.e. between 70% and 100%; see Graph 16), but there is a significant effect of age ($F_{3,69}$=6.686, p=0.000, sig). The HSD Tukey test showed that there are significant differences between 4/5-year-old children and 6-year-old ones (p=0.030, sig.) between 4/5-year-old children and 7-year-old ones (p=0.016, sig.) and between 4/5-year-old children and 8/9-year-old ones (p=0.001, sig.).




Graph 16: Acceptance of *gehienak* 'most' in 4/5 – L1Basque children and adults

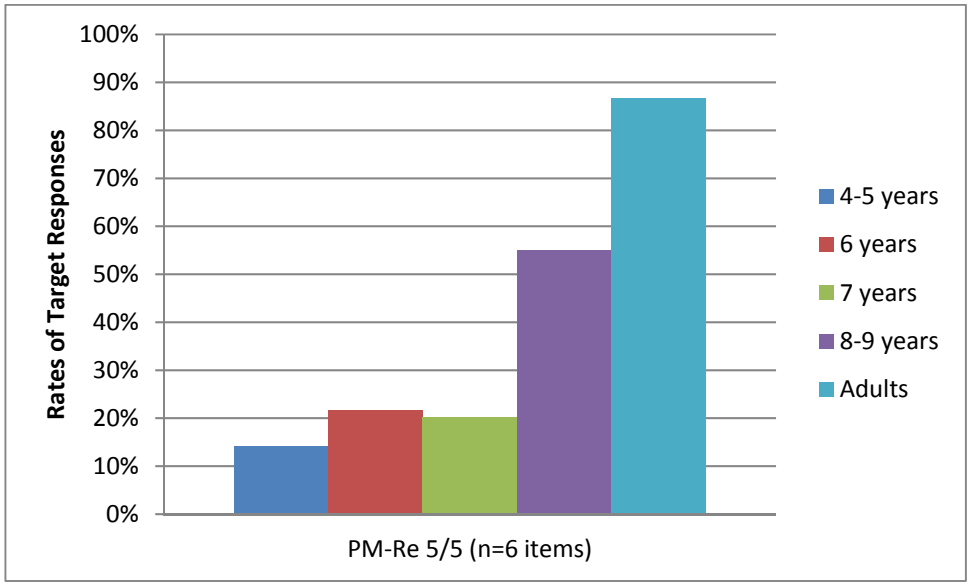
In the 2/5 context children obtain better results as they get older (i.e. from 62% to 90% of target responses; see Graph 17). Within this condition only 4/5-year-old children give at chance answers ($t(20)=1,324$; $p=0,201$). In addition, a significant effect of age can be observed ($F_{3,69}=3.000$, $p=0.036$, sig), since the HSD Tukey test revealed that there are significant differences between 4/5-year-old children and 8/9-year-old ones ($p=0.036$, sig.)




Graph 17: Rejection of *gehienak* 'most' in 2/5 – L1Basque children and adults

In Graph 18 it can be observed that the results that L1Basque children obtain with the PM of *gehienak* are very low, even for 8/9-year-old children (55% of TR), who behave at chance in this condition (t(16)=0,481; p=0,637) .

Nevertheless, there is a significant effect of age ($F_{3,69}$=5.102, p=0.003, sig). In fact, the HSD Tukey test revealed that there are significant differences between 4/5-year-old children and 8/9-year-old ones (p=0.003, sig.) between 6-year-old children and 8/9-year-old ones (p=0.029, sig.) and between 7-year-old children and 8/9-year-old ones (p=0.017, sig.). Therefore, from these data it can be concluded that although at age 6 they have already acquired the SM of *gehienak*, at age 8-9 they do not still know its PM.




Graph 18: Rejection of *gehienak* 'most' in 5/5 – L1Basque children and adults

Regarding the comprehension of positive quantifiers by L1 Basque children the following can be observed:

(a) L1 Basque children know the SM of *guztiak* by age 4-5.

(b) With the quantifier *batzuk*:

(i) L1 Basque children know its SM at age 4-5.

(ii) 7-year-old L1Basque children have difficulties to reject under-informative sentences with this quantifier, and they do not grasp its PM till age 8-9.

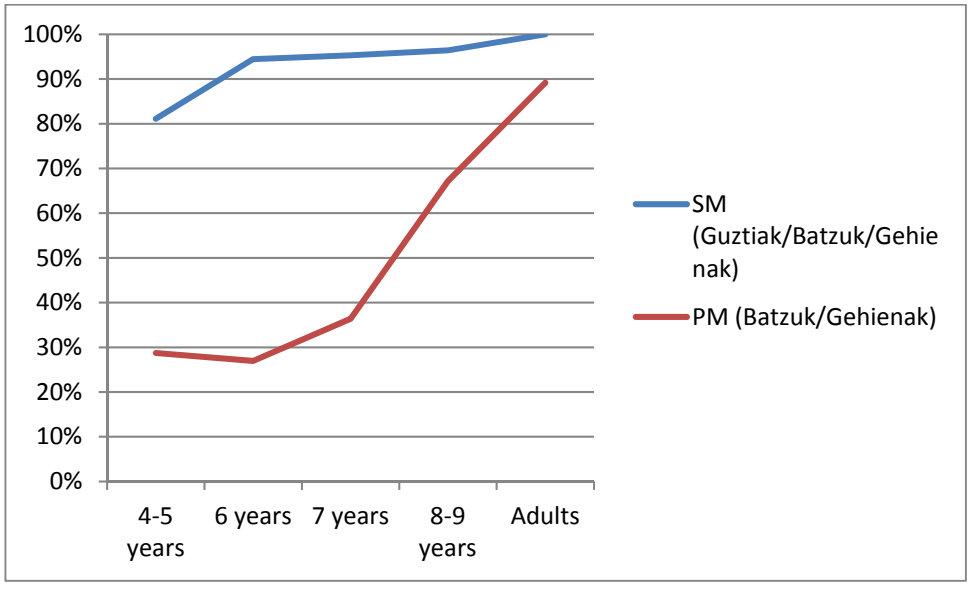
(c) With the quantifier *gehienak*:

(i) L1 Basque children show more difficulties when recognizing that its truth-values are false, than when they are true, but these difficulties diminish as they are older.

(ii) L1 Basque children do not reject under-informative sentences with this quantifier, and at age 8-9 they do not still know its PM. This means that they are not deriving SIs with this quantifier.

4.1.5.2.2 Semantic meaning vs. pragmatic meaning

In Graph 19 the mean rates with the SM (of *guztiak*, *batzuk* and *gehienak*) and the PM (of *batzuk* and *gehienak*) that L1Basque children and adults obtain are shown:




Graph 19: Mean rates with SM and PM – Positive Quantifiers – L1Basque children and adults

In Graph 19 it can be observed that the knowledge of both the SM and the PM gradually increases as the participants get older. However, while the results with the SM are high by age 4-5 (81% of TR), the results with the PM are low at that same age (29% of TR) and they increase gradually till age 8-9, when children obtain a 67% of TR.

The observed pattern suggests the following:

(i) the evolution of the SM of positive quantifiers by L1Basque children is different from the one of the PM.

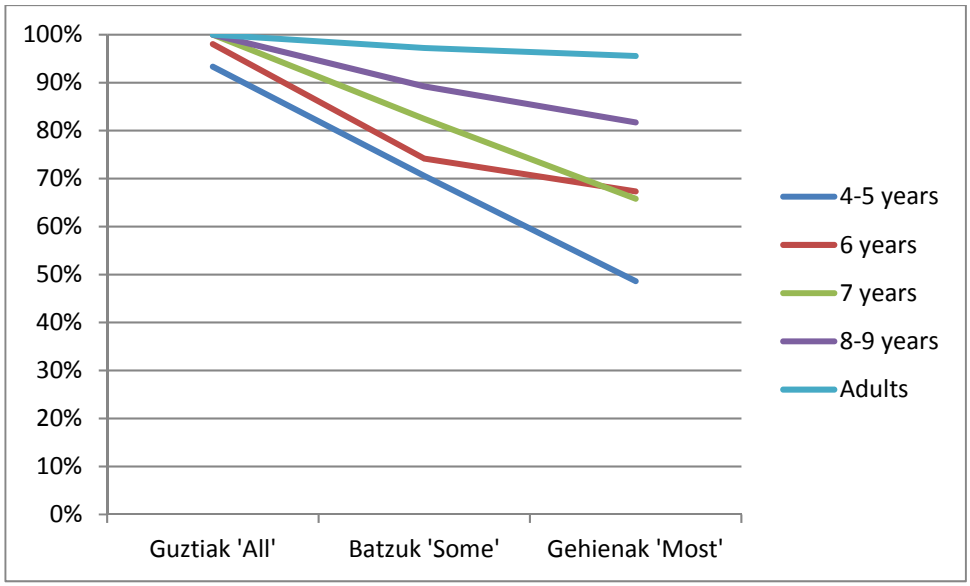
(ii) the SM of positive quantifiers is known by L1Basque children by age 4-5.

(iii) the PM of positive quantifiers is acquired gradually as children get older.

(iv) knowing the SM of a quantifier does not imply the knowledge of its PM.

4.1.5.2.3 Order of acquisition of the quantifiers

In Graph 20, the overall mean rates (SM + PM) with positive quantifiers (*guztiak*, *batzuk* and *gehienak*) obtained by L1Basque children and adults are plotted:




Graph 20: Overall mean rates with positive quantifiers (*guztiak* 'all', *batzuk* 'some' and *gehienak* 'most') – L1Basque children and adults

Graph 20 is very homogeneous and it can be observed that the quantifier which is acquired first is *guztiak*, since it obtains high target answers since age 4-5 (93%). It is followed by the quantifier *batzuk*, which obtains a 71% of target answers at age 4-5. The quantifier which obtains the lowest scores is *gehienak*, whose mean rate at age 7 is still 66%. The interesting fact about this pattern ─ *guztiak* > *batzuk* > *gehienak* ─ is that it is the same in all age groups, and moreover, it is the same pattern found with L1Spanish children.

Summing up, based on the results obtained by both L1 Spanish and L1 Basque children, the following can be observed:

(a) Both L1 Spanish and L1 Basque children know the SM of *todos* / *guztiak* at age 4-5.

(b) With the quantifier *algunos / batzuk*:
   (i) Both L1 Spanish and L1 Basque children know its SM at age 4-5.
   (ii) While with L1 Spanish children a gradual increase in the rejection of under-informative sentences with *algunos* from 4- to 7-years of age can

be observed (and thus a better understanding of the PM of this quantifier), L1Basque children still have difficulties to reject under-informative sentences with this quantifier at 7-years of age, and they do not grasp its PM till age 8-9.

(c) With the quantifier *la mayoría / gehienak*:
   (i) Both L1 Spanish and L1 Basque children show more difficulties when recognizing that its truth-values are false, than when they are true, but these difficulties diminish as they are older. However, L1 Basque children seem to have a better understanding of the SM of this quantifier in comparison to L1 Spanish children.
   (ii) Neither L1 Spanish (at age 7) nor L1 Basque children (at age 8-9) reject under-informative sentences with this quantifier, what means that they do not still know its PM.

(d) The evolution of the SM of positive quantifiers is different from the one of the PM with both L1 Spanish and L1 Basque children:
   (i) the SM of positive quantifiers is known earlier than the PM.
   (ii) the PM of positive quantifiers is acquired gradually as children get older.
   (iii) knowing the SM of a quantifier does not imply the knowledge of its PM.

(e) The same pattern in the acquisition of positive quantifiers has been observed in the two languages (see (38)):

(38) a. [*todos* > *algunos* > *la mayoría*]
   b. [*guztiak* > *batzuk* > *gehienak*]

### 4.1.6 Discussion

Regarding the comprehension and acquisition of quantifiers, the first conclusion drawn from the results obtained in this work is related to the quantity denoted by quantifiers. Hanlon (1988) found out that quantifiers that refer to the totality of the potential reference set appear earlier in acquisition over quantifiers whose reference set is a portion of the potential reference set. In the present study, we have observed that the universal quantifiers *todos/guztiak* (which refer to the totality of the potential reference set) are acquired earlier by both L1Spanish and L1Basque children than the existential quantifiers *algunos/batzuk*, whose reference set is a portion of the potential reference set.

The second conclusion relates to the lexical and semantic complexity of each of the quantifiers tested. We have seen that both L1Spanish and L1Basque children (at age 7) have difficulties to comprehend the quantifier *la mayoría/gehienak*, in line with the results obtained by Barberán (2011, 2012) and by Katsos et al. (2016) with 31 languages. The fact that L1Spanish and L1Basque children have not acquired the SM of this quantifier predicts itself a difficulty in the acquisition of its PM, and thus on the derivation of SIs. In other words, our data are compatible with the idea (see Barner et al. 2011) that if a child does not know which is the specific quantity denoted by *la mayoría/gehienak* 'most' and to which natural scale *most* belongs (step 1), that child will not be able to know the distribution of *most* in the scale (step 2), the entailment relationships between *most* and the rest of items in the scale (step 3), and which are the potential alternatives to be rejected in that scale (step 4).

The third conclusion we can draw from the data collected in this work has to do with the informativeness (PM) and the truth-conditions (SM) of quantifiers. While children access the SM of quantifiers from an early age (and thus they are able to discriminate if the truth-conditions are satisfied or not by the context in question), the PM of quantifiers appears later in acquisition (in line with previous

literature on the early acquisition of quantification; see Noveck 2001, 2004; Katsos et al. 2012; Guasti et al. 2005; Papafragou & Musolino, 2003). In fact, children's comprehension rates are higher with true/false-and-informative sentences (which only require the satisfaction of the truth-conditions), than with true-but-under-informative utterances (which also require the derivation of the SI).

Nevertheless, a difference in the results between Basque and Spanish children has been observed as regards the quantifier *algunos* in Spanish and *batzuk* in Basque. Indeed, while Spanish children are able to derive a SI and reject under-informative sentences with *algunos* (thus, they know its PM) by the age of 7, Basque children do not seem to fully grasp the PM of *batzuk* till the age of 8-9. This difference between the Age of Acquisition (AoA) of Spanish *algunos* and Basque *batzuk* will be discussed in Chapter 8.

Finally, it has also been observed that the L1Spanish and Basque adults tested in the present study potentially derive SIs (i.e. reject under-informative sentences) with the quantifiers tested for their PM, i.e. *algunos* and *la mayoría* for Spanish, and *batzuk* and *gehienak* for Basque.

# CHAPTER 5: NEGATED QUANTIFIERS

In this chapter the results obtained in the FLA study with the negated quantifiers from Version 1 of EXPERIMENT 1 are presented (*ninguno* 'none', *no todos* 'not all' and *algunos no* 'some not' in Spanish, and *bat ere ez* 'none', *guztiak ez* 'all not' and *batzuk ez* 'some not' in Basque), as part of the scale {none, not all, some not}, and HYP1 and HYP2, RQ1 and RQ2, and Predictions 1 to 3 are tested (see Chapter 4).

## 5.1 SENTENCE EVALUATION TASK (EXPERIMENT 1 – VERSION 1)

### 5.1.1 Specific Research Questions

1) How and when do 4- to 7/9-year-old L1Spanish and L1Basque children comprehend:
   (a) *ninguno* for Spanish and *bat ere ez* for Basque,
   (b) *todos* and *guztiak* plus a negative operator, and
   (c) *algunos* and *batzuk* plus a negative operator?

2) How do L1 Spanish and L1 Basque adults comprehend those quantifiers? And L1 Basque adult controls?

3) Are there similarities/differences between age groups? And between languages? Can we observe a specific developmental pattern as with positive quantifiers?

### 5.1.2 Specific Predictions

Based on the literature reviewed on quantification in Chapter 2, our predictions for Spanish and Basque are the following:

1) 4- to 7/9-year-old L1Spanish and L1Basque…

a) children's rates of comprehension will be higher with monotone increasing quantifiers (*todos* and *algunos* for Spanish, and *guztiak* and *batzuk* for Basque) than with monotone decreasing ones (*no todos* and *algunos no* for Spanish, and *guztiak ez* and *batzuk ez* for Basque) (see Katsos et al. 2016).

b) children will have fewer difficulties detecting true/false-and-informative sentences than detecting true-but-under-informative ones (see Noveck 2001, 2004; Guasti et al. 2005; Papafragou & Musolino 2003; a.o.).

2) Taking into account that adults show no difficulties in detecting violations of truth-conditions and informativeness (see Guasti et al. 2005; Noveck 2001; Papafragou & Musolino 2003), we predict that Spanish and Basque adults will have no difficulties in detecting neither violations of truth-conditions nor of informativeness.

3) Based on the fact that children have difficulties to detect violations of informativeness (Noveck 2001, 2004), contrary to adults, we expect to find differences between the comprehension pattern of Spanish/Basque adults and the one by Spanish/Basque children in that respect.

### 5.1.3 Material

In this section the results obtained with negated quantifiers will be described (the results of the positive quantifiers were presented in Chapter 4). In Table 6 (information taken from Table 1) all the combinations with the negated quantifiers, the meanings tested and the possible contexts are presented, together with the target response, the number of items (per meaning and quantifier) and a brief explanation.

| Quantifier (Q) | Meaning tested | Nº of Items | Context (C) | Target (adult-like) Response | Why? The Q in that C is… |
|---|---|---|---|---|---|
| ***ninguno/ bat ere ez*** **'none'** | SC | 3 | 0/5 | Right | Semantically true |
| | | 3 | 2/5 | Wrong | Semantically false |
| ***no todos/ guztiak ez*** **'not all'** | PC | 6 | 0/5 | Wrong | Pragmatically infelicitous (under-informative) |
| | SC | 3 | 2/5 | Right | Semantically true |
| | | 3 | 5/5 | Wrong | Semantically false |
| ***algunos no batzuk ez*** **'some not'** | PC | 6 | 0/5 | Wrong | Pragmatically infelicitous (under-informative) |
| | SC | 3 | 2/5 | Right | Semantically true |
| | | 3 | 5/5 | Wrong | Semantically false |

Table 6: SET (Version 1) – Negated Quantifiers

### 5.1.4 Participants

As described in section 4.1.4, a total of 158 children and adults participated in the study divided by language profile (L1Spanish or L1Basque) and age (see Tables 7 and 8, repeated from Tables 4 and 5).

| | 4-year-olds | 5-year-olds | 6-year-olds | 7-year-olds | Adults |
|---|---|---|---|---|---|
| **L1 Spanish (n=73)** | mean: 4;4<br>range <3;8-4;8><br>(n=17) | mean: 5;4<br>range <5;0-5;9><br>(n=21) | mean: 6;5<br>range <6;2-6:9><br>(n=10) | mean: 7;1<br>range <7;0-7;4><br>(n=13) | (n=12) |

Table 7: Participants in the Spanish Experiment (SET – Version 1)

| | 4/5-year-olds | 6-year-olds | 7-year-olds | 8/9-year-olds | Adults |
|---|---|---|---|---|---|
| **L1 Basque (n=85)** | mean: 4;5 range <4;0-4;9> (n=21) | mean: 6;5 range <6;0-6;9> (n=17) | mean: 7;4 range <7;2-7;8> (n=20) | mean: 8;4 range <8;0-8;9> (n=17) | (n=10) |

Table 8: Participants in the Basque Experiment (SET – Version 1)

### 5.1.5 Results

5.1.5.1 Spanish experiment (SET)

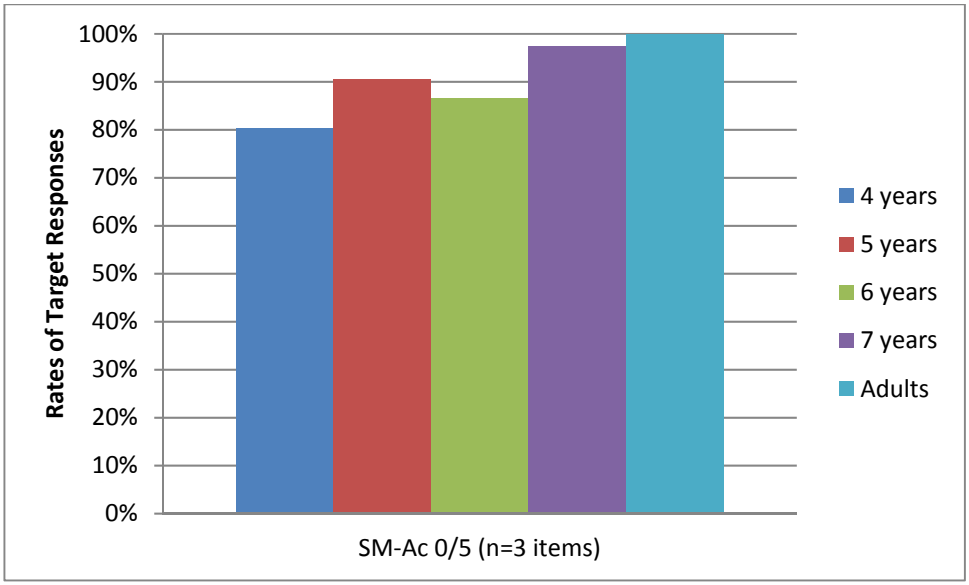
As explained in Chapter 3, both the SM and the PM of the quantifiers were tested in the SET. For the PM, the Target (adult-like) Response (TR) is to reject the sentences (to say 'Wrong'), based on the fact that the sentences are pragmatically infelicitous in the contexts presented on the screen. For the SM, for half of the sentences the TR is to accept the sentences (to say 'Right'), taking into account that the truth-values of the sentences are satisfied by the context in question; for the other half of the sentences, the TR is to reject the sentences, based on the fact that the truth-values of the sentences are not satisfied by the context. Along this and next sections, Graphs indicate the rates of the TR that participants obtain for the SM and the PM of *ninguno*, *no todos* and *algunos no*.

5.1.5.1.1 The development across age groups

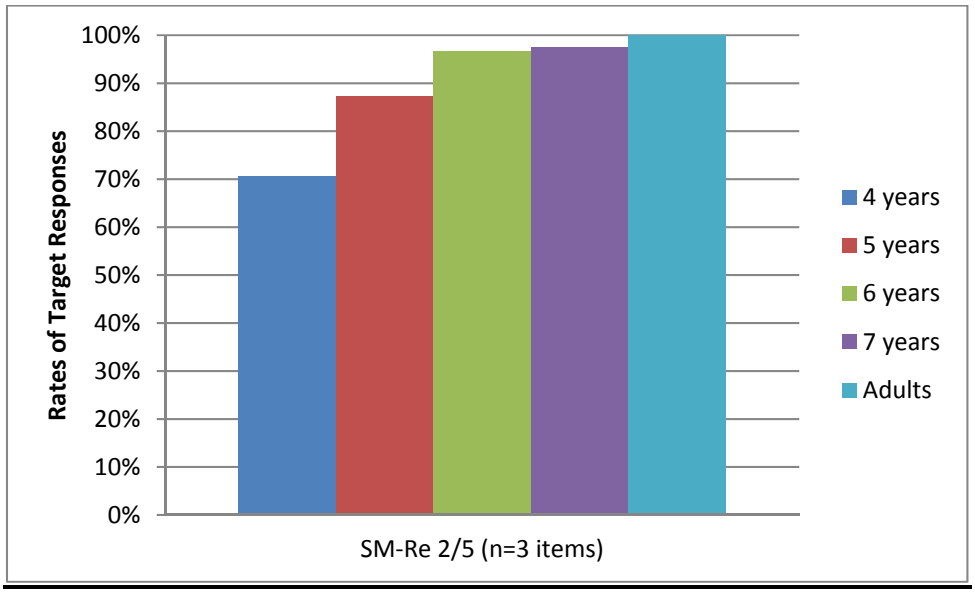
5.1.5.1.1.1 *Ninguno* 'none'

L1 Spanish children obtain high percentages of target responses in all ages (by age 4) with the quantifier *ninguno* in the 0/5 and in the 2/5 contexts. In fact, all the scores go up from 70% of target responses (see Graphs 21 and 22).

These results indicate that L1 Spanish children do not show any difficulties when judging if the truth-conditions of the quantifier *ninguno* are satisfied or not, thus they know the SM of this quantifier already at age 4.[20]




Graph 21: Acceptance of *ninguno* 'none' in 0/5 – L1Spanish children and adults

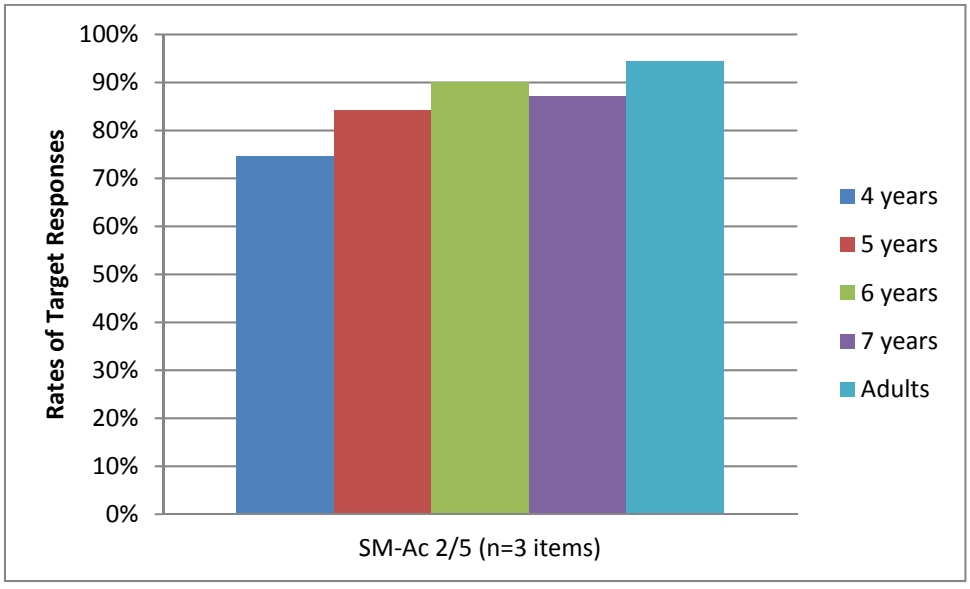



Graph 22: Rejection of *ninguno* 'none' in 2/5 – L1Spanish children and adults

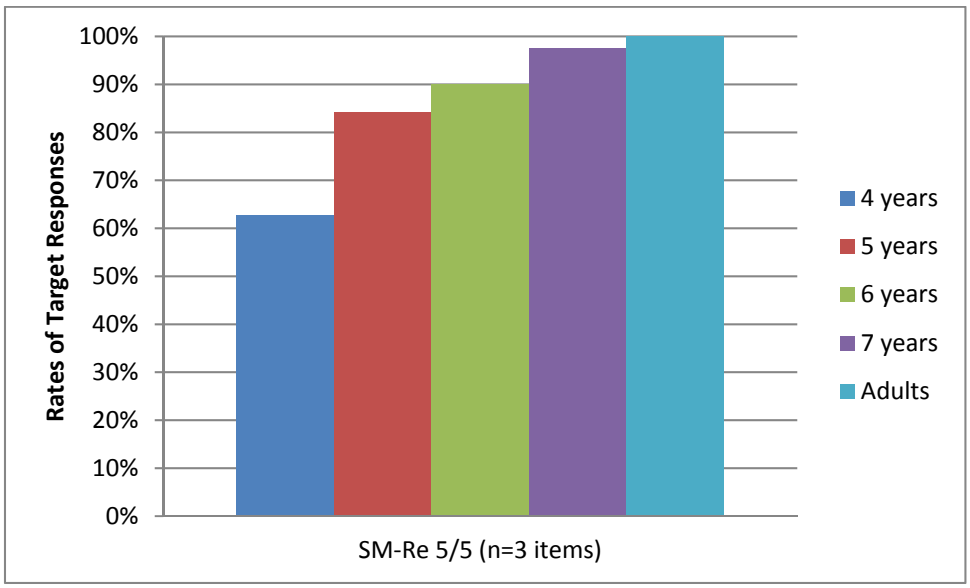
[20] The quantifier *ninguno* 'none' is only tested for its SM, since it cannot be tested in an under-informative condition (see section 4.3).

5.1.5.1.1.2 No *todos* 'not all'

With the quantifier *no todos*, there is a difference between the SM and the PM. Indeed, for the SM, in the 2/5 context the scores are between 74% and 90%, and in the 5/5 context the scores are between 62% and 97% (see Graphs 23 and 24). Within the latter condition, only 4-year-olds give at chance answers (t(16)=1,352; p=0,195), since there is no significant difference between their mean rate (62%) and the chance level 50%. These results indicate that (except for 4-year-old children in the 5/5 context), L1Spanish children know the SM of *no todos*. Moreover, a gradual increase in the rates of target answers can be observed from 4- to 7-year-old children, both in the 2/5 and in the 5/5 contexts. Whereas no effect of age was found ($F_{3,57}$=0.853, p=0.471) in the 2/5 context, a significant effect of age was found ($F_{3,57}$=3.331, p=0.026) in the 5/5 context. In particular, post-hoc pairwise comparisons with a Scheffe test (since the group sizes are different), revealed that 7-year-old children outperform significantly 4-year-old ones (p=0.042, sig.)

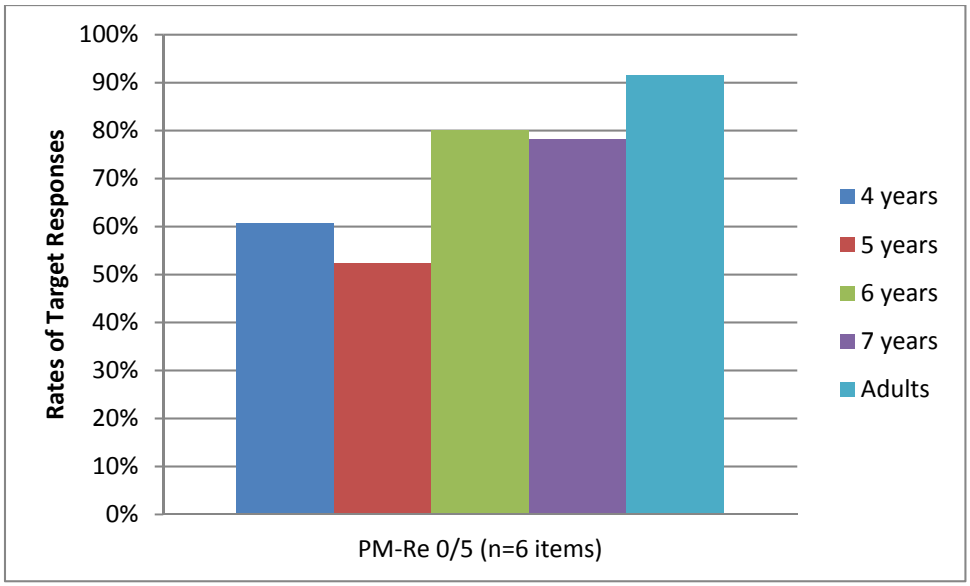



Graph 23: Acceptance of *no todos* 'not all' in 2/5 – L1Spanish children and adults




Graph 24: Rejection of *no todos* 'not all' in 5/5 – L1Spanish children and adults

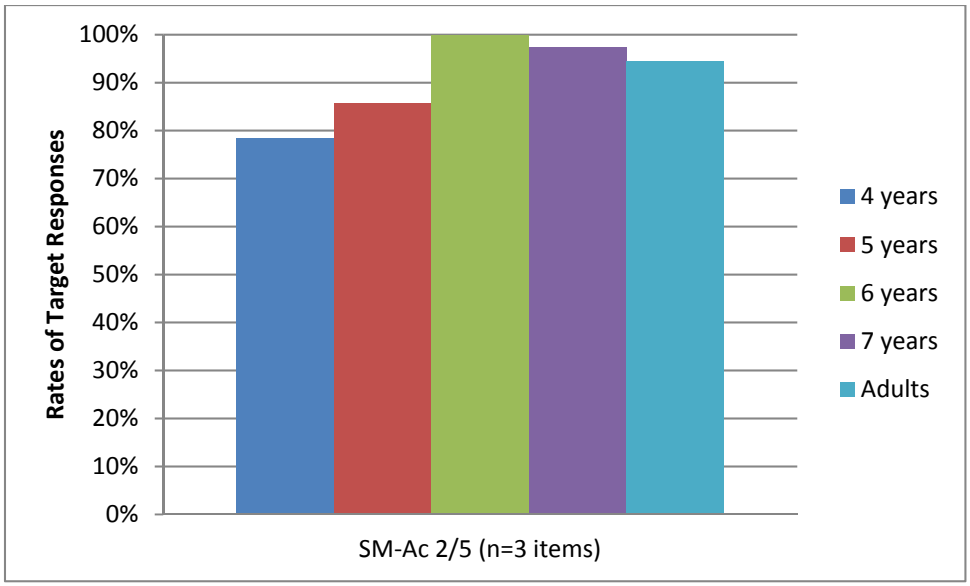
As for the PM of the quantifier *no todos*, all scores are between 52% and 80% of target responses (see Graph 25), but no effect of age was found ($F_{3,57}$=2.076, p=0.113). Within this condition, 4- and 5-year-old children give at chance answers (t(16)=1,113; p=0,282 / t(20)=0,258; p=0,799, respectively), since there is no significant difference between their mean rates (61% and 52%) and the chance level 50%. These results indicate that L1 Spanish children do not acquire the PM of *no todos* (and therefore are not able to reject under-informative sentences with this quantifier) till the age of 6.



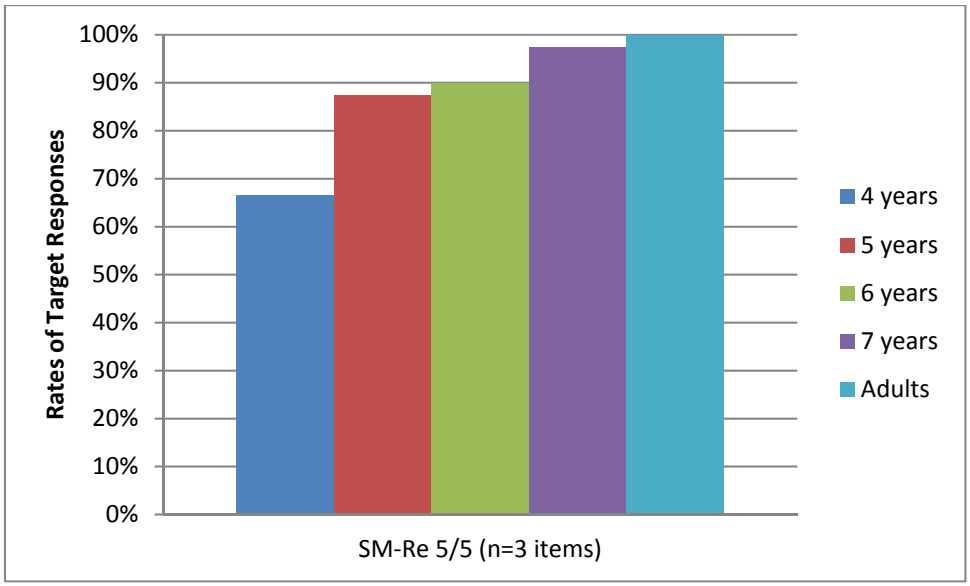

Graph 25: Rejection of *no todos* 'not all' in 0/5 – L1Spanish children and adults

5.1.5.1.1.3 *Algunos no* 'some not'

With the quantifier *algunos* plus the negative operator *no*, a difference between its SM and the PM can also be observed. Indeed, for the SM, in the 2/5 context the scores are between 78% and 100% and in the 5/5 context the scores are between 67% and 97% (see Graphs 26 and 27). Within the latter condition (the 5/5 context), 4-year-old children give at chance answers (t(16)=1,617; p=0,125), since there is no significant difference between their mean rate (67%) and the chance level 50%. Moreover, no effect of age was found in neither of the two conditions ($F_{3,57}$=2.020, p=0.121 / $F_{3,57}$=2.752, p=0.051). These results indicate that (except 4-year-olds in the 5/5 condition) L1Spanish children know the SM of *algunos no*.



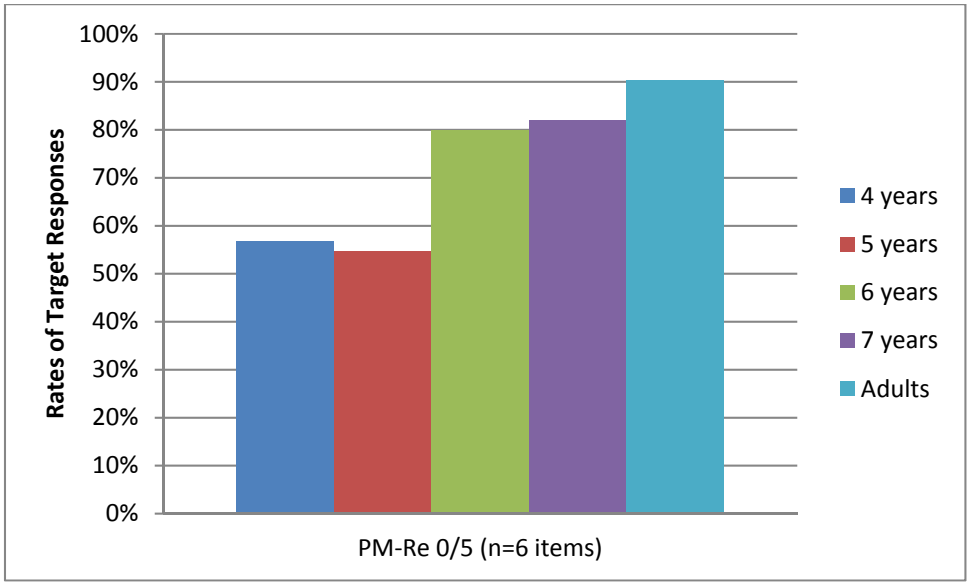

Graph 26: Acceptance of *algunos no* 'some not' in 2/5 – L1Spanish children and adults




Graph 27: Rejection of *algunos no* 'some not' in 5/5 – L1Spanish children and adults

As for the PM of the quantifier *algunos no*, all scores are between 55% and 82% of target responses (see Graph 28). Within this condition, 4- and 5-year-old children give at chance answers (t(16)=0,679; p=0,507 / t(20)=0,553; p=0,587, respectively), since there is no significant difference between their

mean rates (57% and 55%) and the chance level 50%. Though an increase in the rates of target answers can be observed from 4/5- to 6/7-year-old children, no significant effect of age was found ($F_{3,57}$=2.414, p=0.076).




Graph 28: Rejection of *algunos no* 'some not' in 0/5 – L1Spanish children and adults

Summing up, regarding the comprehension of each quantifier by L1 Spanish children and adults the following can be observed:

(a) 4-to-7-year-old L1 Spanish children know the SM of the quantifier *ninguno*.

(b) With the quantifier *no todos*:

(i) L1 Spanish children know its SM (except 4-year-olds in the 5/5 condition).

(ii) We can observe an increase in the rejection of under-informative sentences with *no todos* from 4/5- to 6/7-year-old children, which is statistically significant. Thus, L1 Spanish children do not acquire the PM of *no todos* (and therefore are not able to reject under-informative sentences with this quantifier) at least till the age of 6.

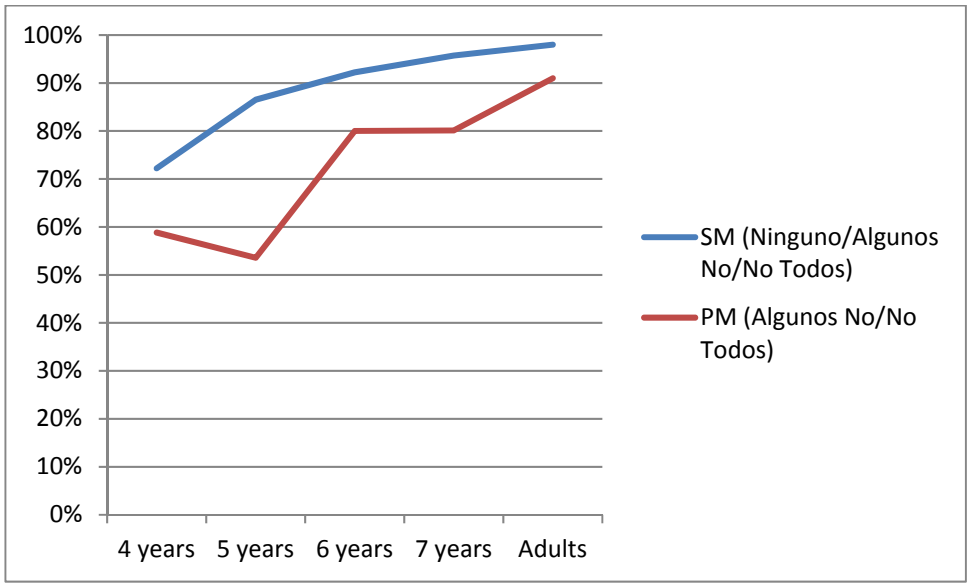
(c) With the quantifier *algunos no*:

(i) L1 Spanish children know its SM (except 4-year-olds in the 5/5 condition).

(ii) We can also observe an increase in the rejection of under-informative sentences with *algunos no* from 4/5- to 6/7-year-old children, but this increase is not statistically significant.

5.2.5.1.2 Semantic meaning vs. pragmatic meaning

In Graph 29 the mean rates with the SM (of *ninguno*, *no todos* and *algunos no*) and the PM (of *no todos* and *algunos no*) that L1Spanish children and adults obtain are plotted:




Graph 29: Mean rates with SM and PM – Negated Quantifiers – L1Spanish children and adults

In Graph 29 it can be observed that the knowledge of both the SM and the PM increases as the participants get older (with the exception of 5-year-olds in the PM, who obtain 54% of TR, in comparison to the 59% of 4-year-olds). Contrary to what happened with positive quantifiers, the evolution of the SM of

negated quantifiers by L1Spanish children is not so distant from the one of the PM.

The observed pattern suggests the following:

(i) the evolution of the SM of negated quantifiers by L1Spanish children is not so different from the one of the PM.

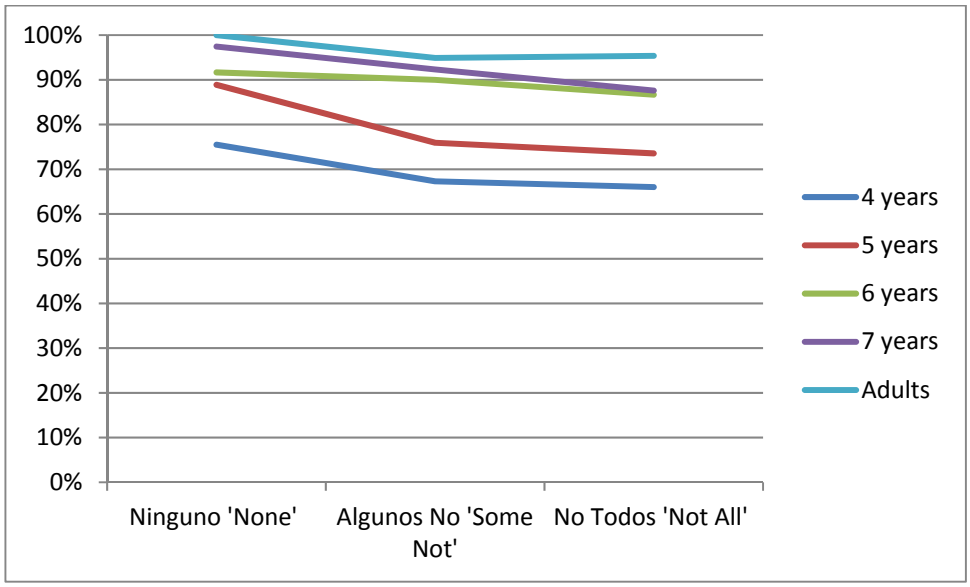
(ii) the SM of negated quantifiers is known by L1Spanish children by age 4 (72% of TR).

(iii) the PM of negated quantifiers seems to be acquired when children are 6-year-old (80% of TR)

(iv) knowing the SM of a quantifier does not imply the knowledge of its PM (mostly observable with 4- and 5-year-olds).

5.1.5.1.3 Order of acquisition of the quantifiers

In Graph 30, the overall mean rates (SM + PM) with negated quantifiers (*ninguno*, *algunos no* and *no todos*) obtained by L1Spanish children and adults are shown:




Graph 30: Overall mean rates with negated quantifiers (*ninguno* 'none', *algunos no* 'some not' and *no todos* 'not all') – L1Spanish children and adults

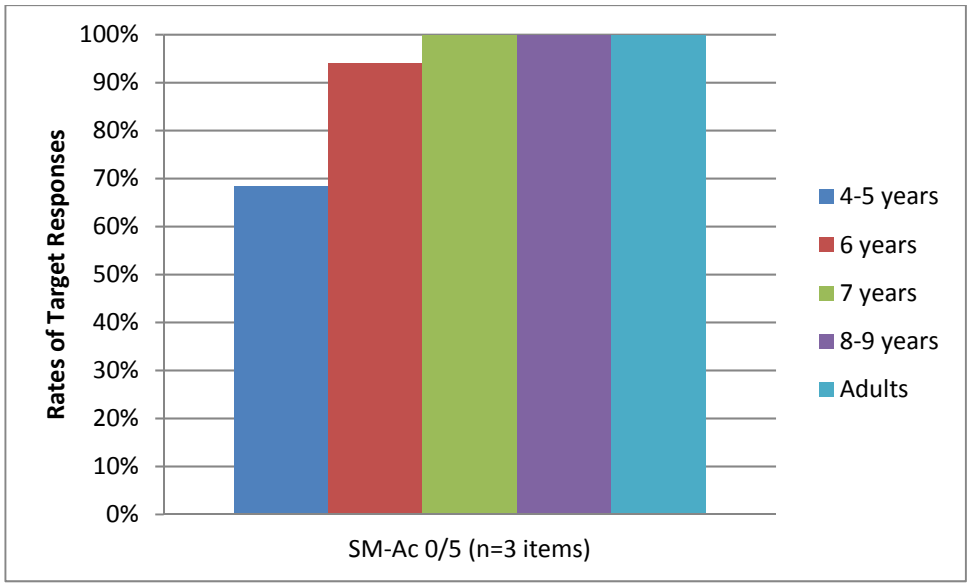
In Graph 30 it can be observed that the quantifier which is best comprehended is *ninguno*, since it obtains high target answers since age 4 (75%). It is followed by the quantifier *algunos no* (which obtains a 67% of target responses at age 4), and then by the quantifier *no todos* (with a 66% of target answers at age 4). As happened with the acquisition of positive quantifiers, this pattern ─ *ninguno* > *algunos no* > *no todos* ─ can be observed in all age groups.

5.1.5.1 Basque experiment (SET)

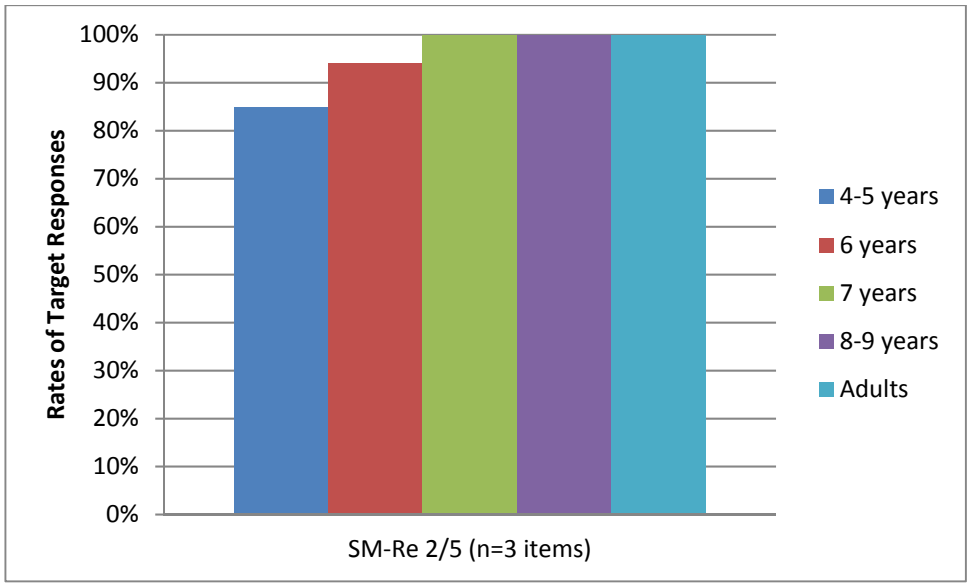
5.1.5.2.1 The development across age groups

5.1.5.2.1.1 *Bat ere ez* 'none'

With the quantifier *bat ere ez* participants obtain high percentages of target responses both in the 0/5 context and in the 2/5 contexts (see Graphs 31 and 32), except for 4-5-year-old children in the former context, who give at chance answers (t(20)=1,993; p=0,061), since there is no significant difference between their mean rate (68%) and the chance level 50%. In the 0/5 context a significant effect of age was found ($F_{3,69}$=8.223, p=0.000, sig). In particular, post-hoc pairwise comparisons with a HSD Tukey test (since the group sizes are similar) revealed that there is a significant difference in the scores between 4-5-year-old and 6-year-old children (p=0.007, sig.), between 4-5-year-old and 7-year-old children (p=0.000, sig.) and between 4-5-year-old and 8-9-year-old children (p=0.001, sig.).




Graph 31: Acceptance of *bat ere ez* 'all' in 0/5 – L1Basque children and adults

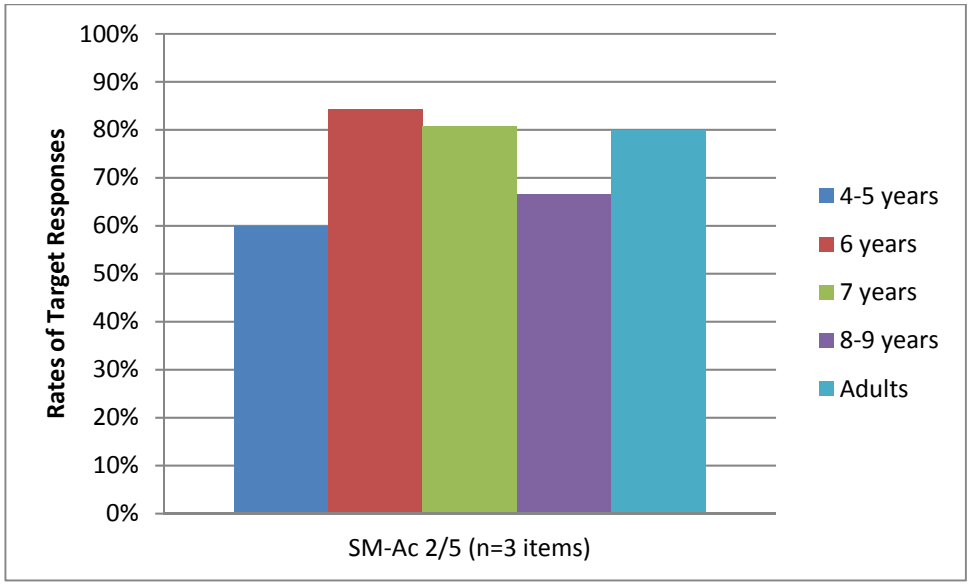



Graph 32: Rejection of *bat ere ez* 'all' in 2/5 – L1Basque children and adults

5.1.5.2.1.2 *Guztiak ez* 'all not'

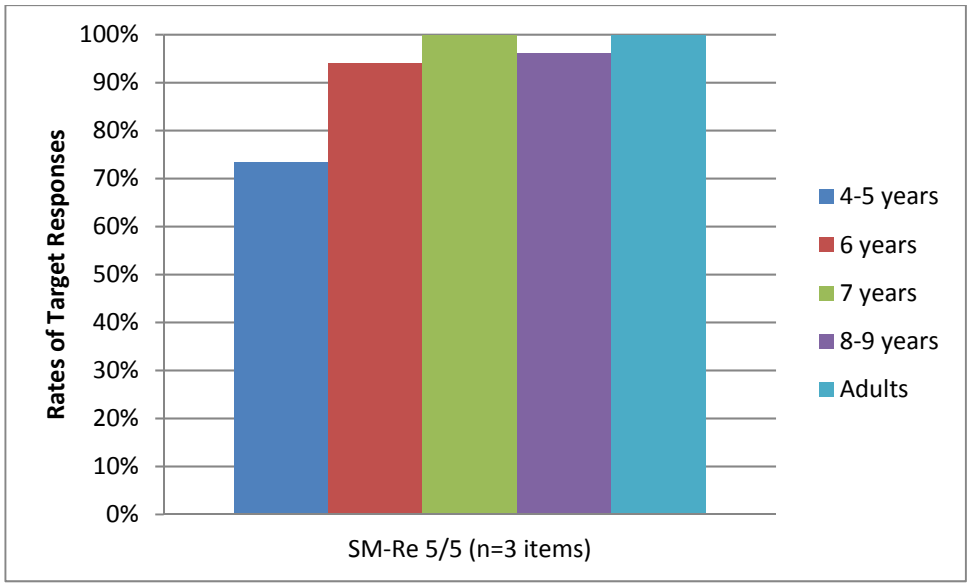
Regarding the quantifier *guztiak* plus the negative operator *ez*, there is a difference in the percentages of target responses within the SM. Indeed, in the 2/5 context, the scores are between 60% and 84% (see Graphs 33). In this condition, 4-5-year-old and 8-9-year-old children give at chance answers

(t(20)=1,121; p=0,276 / t(16)=1,758; p=0,098, respectively), since there is no significant difference between their mean rates (60% and 67%) and the chance level 50%. In any case, no age effect was found ($F4_{,78}$=1.667, p=0.166, sig).




Graph 33: Acceptance of *guztiak ez* 'all not' in 2/5 – L1Basque children and adults

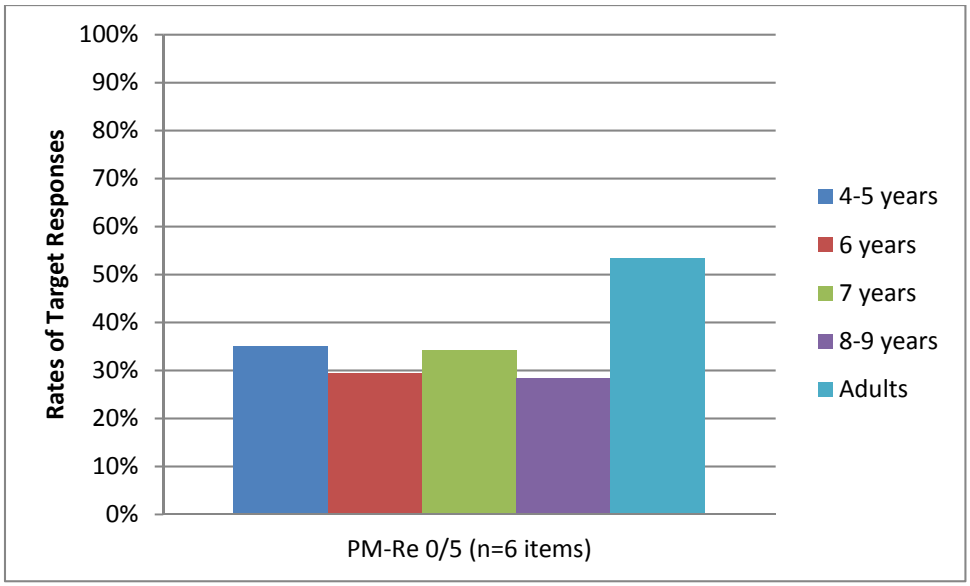
In the 5/5 context, the scores are higher, i.e. between 73% and 100% (see Graph 34), but a significant effect of age was found ($F_{4,78}$=5.119, p=0.001, sig). In particular, the HSD Tukey test showed that there is a significant difference in the scores between 4-5-year-old and 6-year-old children (p=0.031, sig.), between 4-5-year-old and 7-year-old children (p=0.002, sig.) and between 4-5-year-old and 8-9-year-old children (p=0.014, sig.). Thus, children seem to recognize when the truth-conditions of *guztiak ez* are not satisfied (and so reject the sentences) when they are 6-years-old.




Graph 34: Rejection of *guztiak ez* 'all not' in 5/5 – L1Basque children and adults

The percentages of target responses for the PM are very low for all children groups and even for adults, who reject *guztiak ez* in this (0/5) context only in 53% of cases (see Graph 35). Within this condition, even if all the scores are very low, inferential tests reveal that the groups who give at chance answers are 4-5-year-old children (t(20)=-1,577; p=0,131) and adults (t(9)=0,264; p=0,798), since there is no significant difference between their mean rates (35% and 53%) and the chance level 50%. What is more interesting about these results is that no effect of age was found, even in comparison with the adults ($F_{4,78}$=1.017, p=0.404).

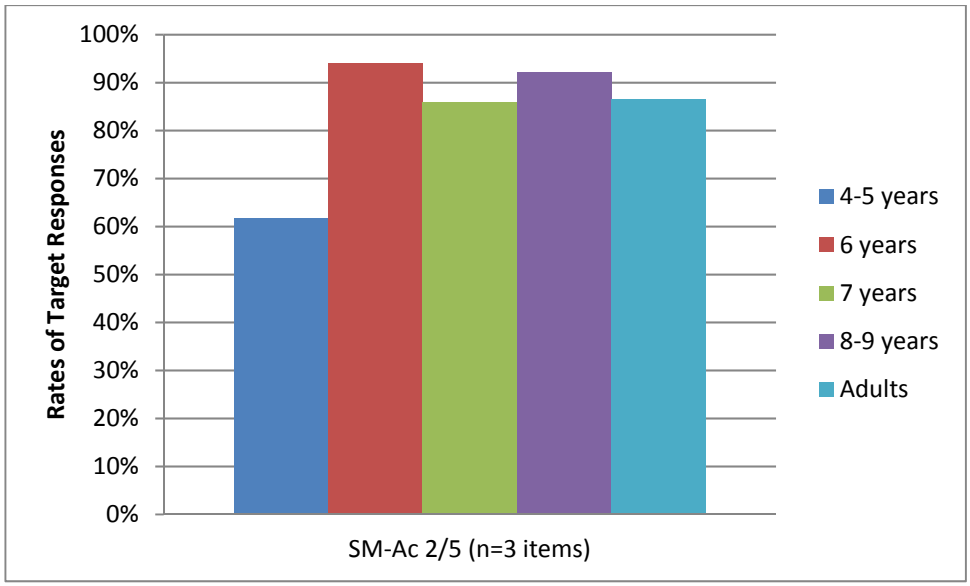
These results suggest that not only children but also adults might be interpreting the universal negated quantifier *guztiak ez* as *none*, contrary to the expected target *some*-reading.




Graph 35: Rejection of *guztiak ez* 'all not' in 0/5 – L1Basque children and adults

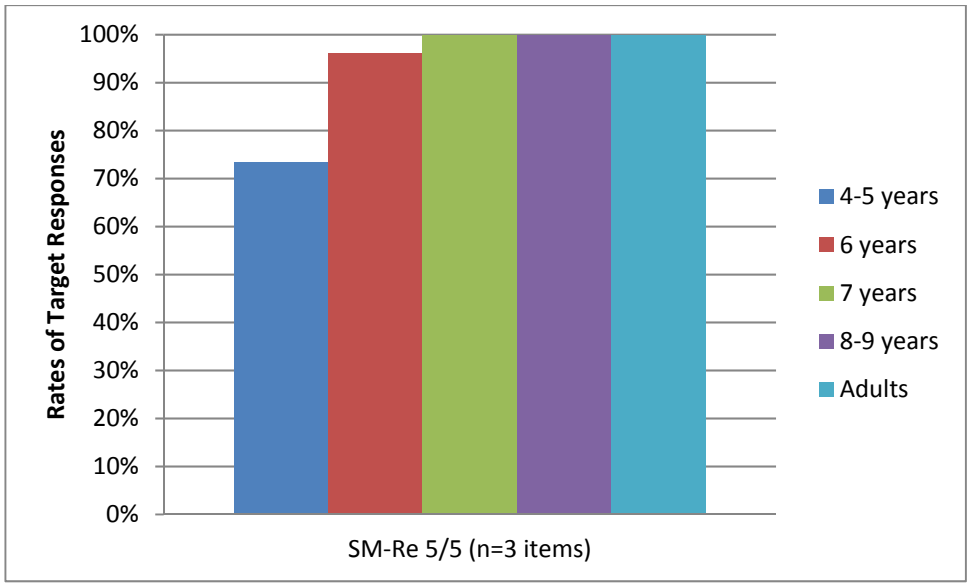
5.1.5.2.1.3 *Batzuk ez* 'some not'

With respect to the quantifier *batzuk* plus the negative operator *ez*, there is also a difference between the SM and the PM. As for the SM, in the 2/5 context all scores are between 62% and 94% of target responses (see Graph 36). Only 4-5-year-old children give at chance answers in this condition (t(20)=1,277; p=0,217), since there is no significant difference between their mean rate (62%) and the chance level 50%. A significant effect of age was found ($F_{4,78}$=3.713, p=0.008, sig). In particular, the HSD Tukey test showed that there is a significant difference in the scores between 4-5-year-old and 6-year-old children (p=0.011, sig.) and between 4-5-year-old and 8-9-year-old children (p=0.020, sig.).




Graph 36: Acceptance of *batzuk ez* 'some not' in 2/5 – L1Basque children and adults

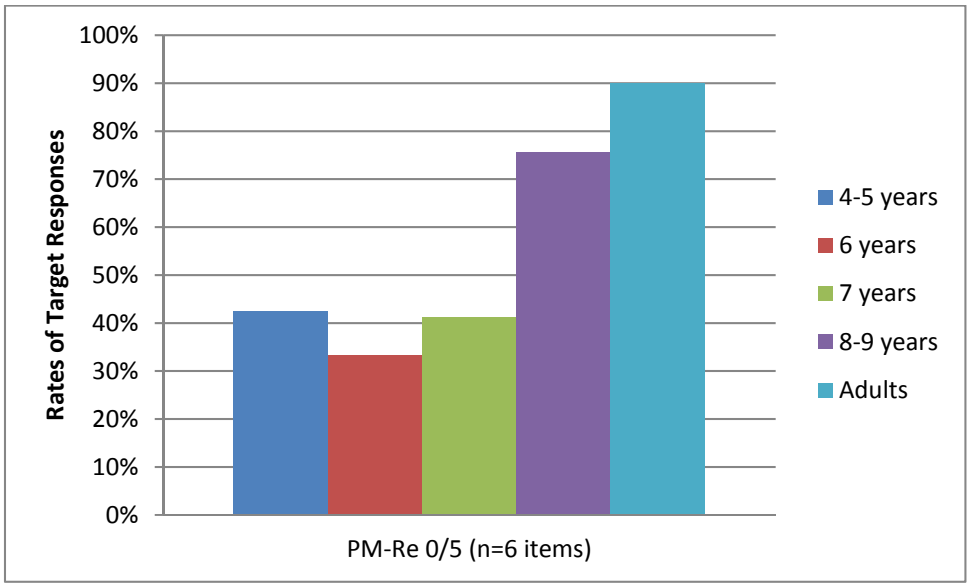
In the 5/5 context, the scores are between 73% and 100% (see Graph37). A significant effect of age was found ($F_{4,78}$=5.751, p=0.000, sig). In particular, the HSD Tukey test revealed that there is a significant difference in the scores between 4-5-year-old and 6-year-old children (p=0.013, sig.), between 4-5-year-old and 7-year-old children (p=0.001, sig.) and between 4-5-year-old and 8-9-year-old children (p=0.002, sig.).




Graph 37: Rejection of *batzuk ez* 'some not' in 5/5 – L1Basque children and adults

These results indicate that L1Basque children know the SM of *batzuk ez* from 6 years onwards.

However, in Graph 38 it can be observed that it is not until age 8-9 that L1Basque children acquire the PM of *batzuk ez* (with a 75% of target responses). Indeed, 4-5-, 6- and 7-year-old-children give at chance answers in this condition (t(20)=-0,856; p=0,403 / t(16)=-1,738; p=0,101 / t(19)=-0,933; p=0,363), since there is no significant difference between their mean rates (43%, 33% and 41%) and the chance level 50%. A significant effect of age was found ($F_{3,69}$=4.045, p=0.010, sig). In particular, the HSD Tukey test revealed that there is a significant difference in the scores between 6-year-old and 8-9-year-old children (p=0.011, sig.) and between 7-year-old and 8-9-year-old children (p=0.046, sig.).




Graph 38: Rejection of *batzuk ez* 'some not' in 0/5 – L1Basque children and adults

Therefore, regarding the comprehension of each quantifier by L1 Basque children we can observe the following:

(a) L1 Basque children know the SM of *bat ere ez* (except 4-5-year-olds in the 0/5 context).

(b) With the quantifier *guztiak* plus the negative operator *ez*:

(i) L1 Basque children do not seem to grasp its SM until the age of 6. And more specifically, they show more difficulties when recognizing that its truth-values are true, than when they are false.

(ii) Neither L1 Basque children nor adults reject under-informative sentences with this quantifier (they obtain very low rates with its PM). This result can be due to the position of Neg with respect to the quantifier (UnivQ-Neg), in comparison to the Spanish *no todos* (Neg-UnivQ) (this point will be further analysed in section 8.2.8).

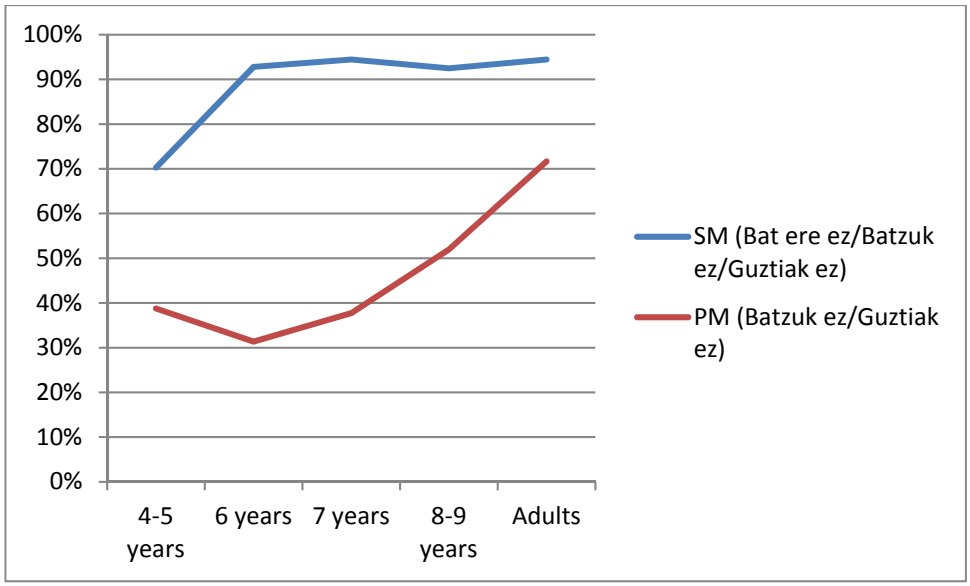
(c) With the quantifier *batzuk* plus the negative operator *ez*:

(i) L1 Basque children know its SM (except 4-5-year-olds in the 0/5 context).

(ii) It is not until age 8-9 that L1Basque children acquire the PM of *batzuk ez*.

5.1.5.2.2 Semantic meaning vs.pragmatic meaning

In Graph 39 the mean rates with the SM (of *bat ere ez*, *guztiak ez* and *batzuk ez*) and the PM (of *guztiak ez* and *batzuk ez*) that L1Basque children and adults obtain are shown:




Graph 39: Mean rates with SM and PM – Negated Quantifiers – L1Basque children and adults

In Graph 39 it can be observed that the knowledge of both the SM and the PM increases as the participants get older (with the exception of 6-year-olds in the PM, who obtain 31% of TR, in comparison to the 39% of 4-5-year-olds). Contrary to what happened with negated quantifiers in Spanish, the evolution of the SM of negated quantifiers by L1Basque children is different from the one of the PM. The acquisition of the SM of negated quantifiers by L1Basque children is faster from 4/5- to 6-year-olds (from 70% to 93% of TR) and then it is constant from 6- to 8/9-year-olds. On the contrary, the acquisition of the PM is slower from 4/5- to 7-year olds and then it increases gradually from 7- to 8/9-year-olds (from 38% to 52% of TR). However, it can be observed that at age 8-9 L1Basque children have not fully acquired the PM of negated quantifiers (i.e. 52%); but having a closer look at the data, that score is due to the results obtained with the PM of *guztiak ez* (28%) and not due to the ones obtained with the PM of *batzuk ez* (75%).

The observed pattern suggests the following:

(i) the evolution of the SM of negated quantifiers by L1Basque children is different from the one of the PM.

(ii) the SM of negated quantifiers is known by L1Basque children by age 4-5 (70% of TR).

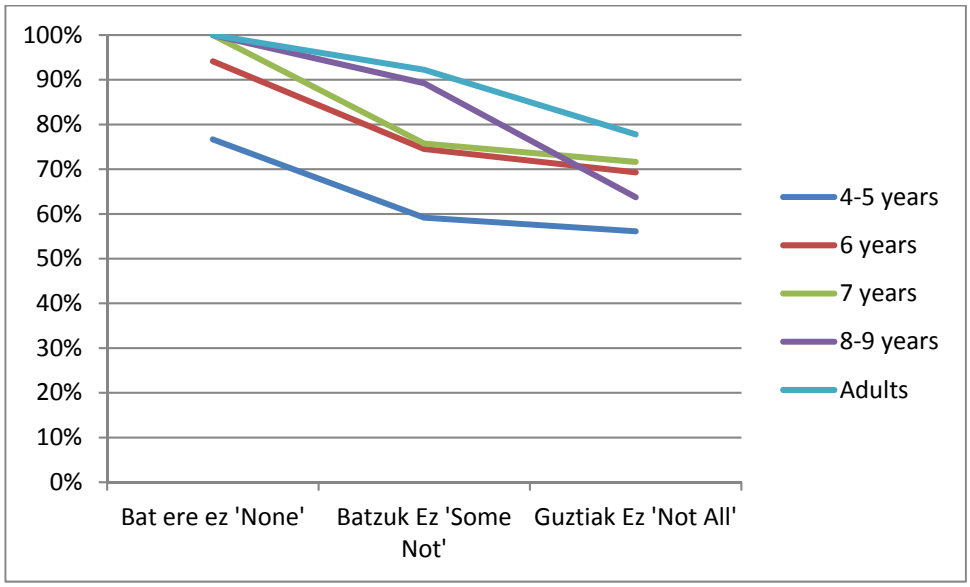
(iii) the PM of *batzuk ez* seems to be acquired when children are 8-9-years-old (75% of TR).

(iv) the PM of *guztiak ez* is not still acquired at age 8-9 (28% of TR).

(v) knowing the SM of a quantifier does not imply the knowledge of its PM.

5.1.5.2.3 Order of acquisition of the quantifiers

In Graph 40, the overall mean rates (SM + PM) with negated quantifiers (*bat ere ez*, *guztiak ez* and *batzuk ez*) obtained by L1Basque children and adults are plotted:




Graph 40: Overall mean rates with negated quantifiers (*bat ere ez* 'none', *guztiak ez* 'all not' and *batzuk ez* 'some not') – L1Basque children and adults

In Graph 40 it can be observed that the quantifier which is best comprehended is *bat ere ez*, since it obtains high target responses since age 4-5 (77%). It is followed by the quantifier *batzuk ez* (which obtains a 59% of target answers at age 4-5), and then by the quantifier *guztiak ez* (with a 56% of target

answers at age 4-5). As happened with the acquisition of positive quantifiers, this pattern ─ *bat ere ez* > *batzuk ez* > *guztiak ez* ─ can be observed in all age groups, and moreover, it is the same pattern found with L1Spanish children.

Summing up, regarding the results obtained by both L1 Spanish and L1 Basque children and adults the following can be observed:

(a) Both L1 Spanish and L1 Basque children know the SM of *ninguno* / *bat ere ez* (except L1 Basque 4-5-year-olds in the 0/5 context).

(b) With the quantifiers *no todos / guztiak ez*:

(i) L1 Spanish children know its SM (except 4-year-olds in the 5/5 condition), and L1 Basque children do not seem to grasp its SM till the age of 5.

(ii) L1 Spanish children do not acquire the PM of *no todos* till the age of 6. Neither L1 Basque children nor adults reject under-informative sentences with the quantifier *guztiak ez* (they obtain very low rates with its PM).

(c) With the quantifier *algunos no / batzuk ez*:

(i) Both L1 Spanish and L1 Basque children know its SM (except L1 Spanish 4-year-olds in the 5/5 condition and L1 Basque 4-5-year-olds in the 0/5 condition).

(ii) L1 Spanish children acquire its PM at the age of 6/7, whereas L1Basque children at the age of 8-9 (in the same way as happened with its positive counterpart *algunos / batzuk*).

(d) The observed pattern suggests the following:

(i) while the evolution of the SM of negated quantifiers by L1Spanish children is not so different from the one of the PM, it is different with L1Basque children.

(ii) the SM of negated quantifiers is known earlier than the PM.
(iii) the PM of negated quantifiers is acquired at 6 years of age by L1 Spanish children, and it is partially acquired by L1 Basque children at age 8-9.
(iv) knowing the SM of a quantifier does not imply the knowledge of its PM.

(e) The same pattern in the acquisition of negated quantifiers has been observed in the two languages (see (39)):

(39) a. [*ninguno* > *algunos no* > *no todos*]
b. [*bat ere ez* > *batzuk* ez > *guztiak ez*]

### 5.1.5 Discussion

The main conclusion drawn from the results obtained with negated quantifiers relates to polarity and the presence of the negative operator. Just & Carpenter (1971) discovered that children's comprehension rates are higher with positive quantifiers than with negated ones. In the present work it has been observed that sentences which have a negated quantifier are more difficult to be comprehended by children than those sentences with a positive quantifier. Thus, negation seems to be a linguistically and psycholinguistically marked function (Orenes et al. 2014; Papeo & de Vega 2019), since negated quantifiers are more complex to be comprehended and processed than their positive counterparts.

The second conclusion drawn from our results is that both Spanish and Basque children have a better comprehension of monotone increasing quantifiers (*todos* and *algunos* for Spanish, and *guztiak* and *batzuk* for Basque) than with monotone decreasing ones (*no todos* and *algunos no* for Spanish, and *guztiak ez* and *batzuk ez* for Basque), in line with Katsos et al. (2016).

The third conclusion relates to the (early/delayed) comprehension of *algunos no* / *batzuk ez* by Spanish and Basque children. As happened with the

positive counterparts *algunos / batzuk*, a difference in the results between Basque and Spanish children has been observed as regards the negated quantifiers *algunos no* / *batzuk ez*. More specifically, while Spanish children are able to derive a SI and reject under-informative sentences with *algunos no* (thus, they know its PM) by the age of 6-7, Basque children do not seem to fully grasp the PM of *batzuk ez* till the age of 8-9.

A striking finding from our results is that the difference in the order of the constituents has had an impact not only on children's readings but also on adults' interpretations. Previous literature has attested that children have difficulties to access non-isomorphic readings and covert movements (Lidz & Musolino 2002), whereas adults are supposed to have full access to non-isomorphic readings and covert movements (i.e. they do not stick to surface scope readings, thus they can access inverse-scope readings). However, our data have shown that L1Basque adults derive an isomorphic *none*-reading with *guztiak ez* 'all not' (UnivQ-Neg) in 47% of cases, in comparison to L1Spanish adults, who derive the isomorphic *some*-reading with *no todos* 'not all' (Neg-UnivQ) in 92% of cases (this will be further discussed in Chapter 8).

Therefore, the position of the negative operator with respect to the quantifier has had a relevant effect not only on children, but also on adults. This has been the main motivation for conducting Version 2 of EXPERIMENT 1, where different orders between the universal quantifier and the negative operator (Neg-UnivQ vs. UnivQ-Neg) have been tested (see Chapter 6).

In conclusion, the AoA of positive quantifiers (Chapter 4) and negated quantifiers (Chapter 5) in L1 Basque and L1 Spanish can be observed in Table 9:

| Language | Q Type | Age 4 | Age 5 | Age 6 | Age 7 | Age 8 | Age 9 | Adults |
|---|---|---|---|---|---|---|---|---|
| L1 Spanish | Positive Qs | todos (SM)<br>algunos (SM) | | algunos (PM) | | | | la mayoría (SM&PM) |
| | Negated Qs | ninguno (SM)<br>algunos no (SM)<br>no todos (SM) | | algunos no (PM)<br>no todos (PM) | | | | |
| L1 Basque | Positive Qs | guztiak (SM)<br>batzuk (SM) | | | | batzuk (PM) | | gehienak (SM&PM) |
| | Negated Qs | bat ere ez (SM) | guztiak ez (SM) | | batzuk ez (SM) | batzuk ez (PM) | | guztiak ez (PM) |

Table 9: AoA of quantifiers in L1 Basque and L1 Spanish

The information provided in Table 9 not only serves to observe the results obtained in a joint manner, but also to see the development in the acquisition of quantifiers by L1 Basque and L1 Spanish children from 4 to 9 years of age. This finding is an important contribution to the field of language acquisition from an intralanguage as well as an interlanguage perspective, as it portrays the precise developmental stages children go through when acquiring natural quantifiers.

# CHAPTER 6: THE INTERACTION BETWEEN UNIVERSAL QUANTIFIERS AND NEGATION

In this chapter, (i) the results obtained in the experiments dealing with the interaction between universal quantifiers and negation in the FLA study are described, and (ii) HYP 3, RQ3 and Predictions 5 and 6 are tested, repeated here for the reader's convenience:

**HYPOTHESIS:**

HYP3. The "Observation of Isomorphism" accounts for children's interpretation of sentences containing a universal quantifier and a negative operator (Musolino 1998; Musolino et al. 2000).

**RESEARCH QUESTION:**

RQ3. Does the "Observation of Isomorphism" (Musolino 1998; Musolino et al. 2000) account for Basque and Spanish children's interpretation of sentences containing a universal quantifier and a negative operator?

**PREDICTIONS:**

PREDICTION 5: THE ORDER BETWEEN UNIVQS & NEG WILL DETERMINE THE RESULTING INTERPRETATION.

PREDICTION 6: THE KIND OF TASK WILL HAVE AN EFFECT ON THE UNIVQ-NEG / NEG-UNIVQ INTERPRETATION.

It has already been observed (see Chapter 5) that 4/5-year-old Basque and Spanish children have already acquired the semantic meaning of the universal quantifiers *guztiak* for Basque and *todos* for Spanish. But what happens when we combine these universal quantifiers with a negative operator in different orders

(UnivQ-Neg vs. Neg-UnivQ) in each language? [21] Do children obtain similar interpretations in both languages or not? And most importantly, does the Observation of Isomorphism (Musolino 1998; Musolino et al. 2000) account for Basque and Spanish children's interpretations?

The present chapter aims to explore how Basque and Spanish 5-year-old children interpret 'not all/all not' for Spanish *no todos/todos no* and for Basque *ez guztiak/guztiak ez*, and specifically, if the position of the negative operator with respect to the universal quantifier has an impact on the interpretation of the sentence.

As seen in section 2.1.4.2.2.3, the methodology employed can influence on the outcome of the experiment (see Featherston 2005; Schmitt & Miller 2010; a.o.), so in order to control possible task effects, two different experiments were carried out: a Sentence Evaluation Task (SET - Version 2 of EXPERIMENT 1) and a Picture Selection Task (PST). While in the SET participants evaluated if they accepted or rejected a specific reading, in the PST they could express their preference for one reading over the other.

In section 6.1 the specific research questions are outlined, in section 6.2 a description of Spanish and Basque negated quantifiers is given together with the specific predictions, in section 6.3 the results obtained from the SET are plotted, and in section 6.4 the results from the PST are given.

## 6.1 SPECIFIC RESEARCH QUESTIONS

(i) Are 5-to-6-year-old L1Spanish and L1Basque children sensitive to the different scope relations between UnivQ-Neg / Neg-UnivQ?

[21] When the symbol "-" is used, linear order is expressed; when ">" is used, structutal order/scope is meant (in this case, the first element having scope over the second one).

(ii) Regarding the interpretation of those structures,
   a) are there differences between L1Spanish children and L1Basque children? And between L1Spanish adults and L1Basque adults?
   b) are there differences between L1Spanish children and adults? And between L1Basque children and adults?

(iii) Can our results be accounted for by the "Observation of Isomorphism" (Musolino 1998; Musolino et al. 2000)?

(iv) Does the methodology employed (SET & PST) influence on the outcome of the experiments?

## 6.2 NEGATED QUANTIFIERS IN SPANISH AND BASQUE AND PREDICTIONS

It must be taken into account that while Spanish is a Subject-Verb-Object (SVO) language, Basque is a Subject-Object-Verb (SOV) language, and the NegP does not occupy the same position in both languages. As explained in section 2.2.1.2, in relation to polarity, we assume that the markers of sentential negation (i.e. negative operators) are functional heads, $Neg_o$, which project a Negative Phrase (NegP) (cf. Pollock 1989; Laka 1990; Zanuttini 1991).

In a Spanish sentence like (40), the negative operator *no* linearly precedes the quantifier *todas*, so its surface/overt syntactic scope is Neg>UnivQ.

(40) No todas las manzanas están en las cajas
not all the apples are in the boxes
"Not all the apples are in the boxes"

The "Observation of Isomorphism" (Musolino 1998; Musolino et al. 2000) stated (see section 2.2.2.1) that "children's semantic scope coincides with overt syntactic scope", thus our prediction would be the following one:

> *Prediction 1*: L1Spanish children will interpret a sentence like "No todas las manzanas están en las cajas" ('Not all the apples are in the boxes') with Neg having scope over the QP *todas las manzanas*, thus they will derive a *some*-reading.

In contrast, in a sentence like (41), the QP *todas las manzanas* linearly precedes the negative operator *no*, so its overt syntactic scope is UnivQ>Neg.

(41) Todas las manzanas no están en las cajas
all the apples not are in the boxes
"All the apples are not in the boxes"

Based on the "Observation of Isomorphism", our second prediction would be the following one:

> *Prediction 2*: L1Spanish children will interpret a sentence like "Todas las manzanas no están en las cajas" ('All the apples are not in the boxes') with the QP *todas las manzanas* having scope over Neg, thus they will derive a *none*-Reading.

Similarly, in a Basque sentence like (42), the negative operator *ez* linearly precedes the quantifier *guztiak*, so its overt syntactic scope is Neg>UnivQ.

(42) Ez daude sagar guztiak kutxetan
not are apples all-the boxes-the-in
"Not all the apples are in the boxes"

As with Spanish, if the "Observation of Isomorphism" (Musolino 1998; Musolino et al. 2000) is right, and "children's semantic scope coincides with overt syntactic scope", our prediction would be the following one:

> *Prediction 3*: L1Basque children will interpret a sentence like "Ez daude sagar guztiak kutxetan" ('Not all the apples are in the boxes') with Neg having scope over the QP *sagar guztiak*, thus they will derive a *some*-reading.

On the contrary, in a sentence like (43), the QP *sagar guztiak* linearly precedes the negative operator *ez*, so its overt syntactic scope is UnivQ>Neg.

(43) Sagar guztiak ez daude kutxetan
apples all-the not are boxes-the-in
"All the apples are not in the boxes"

Based on the "Observation of Isomorphism", our prediction would be the following one:

> *Prediction 4*: L1Basque children will interpret a sentence like "Sagar guztiak ez daude kutxetan" ('All the apples are not in the boxes') with the QP *sagar guztiak* having scope over Neg, thus they will derive a *none*-reading.

In sum, these would be the predictions in reduced terms:

*Prediction 1*: Neg-UnivQ = Neg>UnivQ = *some*-reading (Spanish & Basque)

*Prediction 2*: UnivQ-Neg = UnivQ>Neg = *none*-reading (Spanish & Basque)

## 6.3 SENTENCE EVALUATION TASK (EXPERIMENT 1 – VERSION 2)

Based on the differences observed in the results obtained in Version 1 of EXPERIMENT 1 with the negated universal quantifiers between Spanish and Basque, not only with children, but also with adults, another experiment was conducted, in which a modification of Katsos et al.'s (2012) original experiment was made.

Though in Version 2 of the SET the comprehension of the other quantifiers (tested in Version 1) was also tested, only the results obtained with the negated universal quantifiers will be presented, since (i) the aim of the present experiment (Version 2 of the SET) is to see if the different position of the negative operator with respect to the universal quantifier has an effect on the interpretation of the sentences (both with children and adults), and since (ii) the results obtained with the other quantifiers in Version 2 are similar to the ones obtained in Version 1.

### 6.3.1 Method

In Version 1 of the SET, the tested order between the universal quantifier and the negation was Neg-UnivQ for Spanish *no todos* 'not all' (44a) and UnivQ-Neg for Basque *guztiak ez* 'all not' (45b). In Version 2 of the SET, the tested order was the opposite in both languages, i.e. UnivQ-Neg for Spanish *todos no* 'all not' (44a) and Neg-UnivQ for Basque *ez guztiak* 'not all' (45b).

(44) a. NO TODAS las manzanas están en las cajas.
not all the apples are in the boxes
'Not all the apples are in the boxes'.
b. EZ daude sagar GUZTIAK kutxetan.
not are apples all-the boxes-the-in
'Not all the apples are in the boxes'.

(45) a. TODAS las manzanas NO están en las cajas.
all the apples not are in the boxes
'All the apples are not in the boxes'.
b. Sagar GUZTIAK EZ daude kutxetan.
apples all-the not are boxes-the-in
'All the apples are not in the boxes'.

The utterances containing the universal negated quantifiers were produced by the Cavegirl in 3 different contexts (as in Version 1):

- '0/5 context': 0 of the 5 objects are inside the boxes (see Figure 11).
- '2/5 context': 2 of the objects are inside the boxes (see Figure 12).
- '5/5 context': 5 of the 5 objects are inside the boxes (see Figure 13).

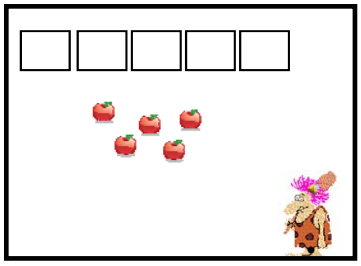


Figure 11: 0/5 context

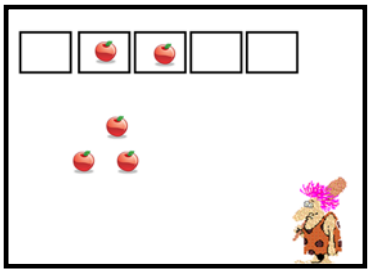


Figure 12: 2/5 context

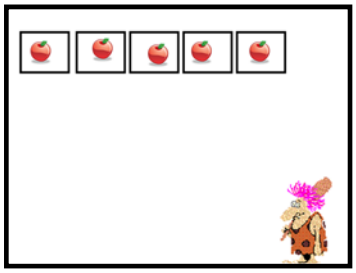


Figure 13: 5/5 context

For clarity purposes of the present study, only the results obtained in the '0/5' and in the '2/5' contexts will be presented, since these are the conditions which specifically test the contrast between the *some*- and the *none*-readings. The '5/5 context' is originally employed (see Katsos et al. 2012) to test if children can distinguish the universal negated quantifiers from a context in which *all* the items are in the boxes (a context where the truth-conditions of the quantifier are not satisfied).

In Table 10 the experimental items, their linear order and the possible responses (based on each arrangement), together with their codification and interpretation is presented.

| Exp. Item | Lineal Order | Arrangement | Possible Responses | Interpretation | Codification |
|---|---|---|---|---|---|
| ***no todos / ez guztiak* 'not all'** | Neg-UnivQ | 0/5 | Right | ∀¬ | Non-isomorphic reading |
| | | | Wrong | ¬∀ | Isomorphic reading |
| | | 2/5 | Right | ¬∀ | Isomorphic reading |
| | | | Wrong | ∀¬ | Non-isomorphic reading |
| ***todos no / guztiak ez* 'all not'** | UnivQ-Neg | 0/5 | Right | ∀¬ | Isomorphic reading |
| | | | Wrong | ¬∀ | Non-isomorphic reading |
| | | 2/5 | Right | ¬∀ | Non-isomorphic reading |
| | | | Wrong | ∀¬ | Isomorphic reading |

Table 10: Codification - SET – Version 2

When the order Neg-UnivQ (*no todos* / *ez guztiak* 'not all') is tested, saying 'Right' (i.e. accepting the sentence) in the 0/5 context means deriving a ∀¬ (NONE) interpretation, thus accessing a non-isomorphic reading (where the UnivQ takes scope over Neg). On the contrary, saying 'Wrong' (i.e. rejecting the sentence) in the 0/5 context means deriving a ¬∀ (NOT ALL=SOME) interpretation, thus accessing an isomorphic reading (where Neg takes scope over UnivQ). In the 2/5 context, accepting the sentence means deriving a ¬∀ (NOT ALL=SOME) interpretation, thus accessing an isomorphic reading (where Neg takes scope over Q). On the contrary, rejecting the sentence in the 2/5 context means deriving a ∀¬ (NONE) interpretation, thus accessing a non-isomorphic reading (where the UnivQ takes scope over Neg).

When the order UnivQ-Neg (*todos no* / *guztiak ez* 'all not') is tested, accepting the sentence in the 0/5 context means deriving a ∀¬ (NONE) interpretation, thus accessing in this case an isomorphic reading (UnivQ>Neg). On the contrary, rejecting the sentence in the 0/5 context means deriving a ¬∀ (NOT ALL=SOME) interpretation, thus accessing a non-isomorphic reading (Neg>UnivQ). In the 2/5 context, accepting the sentence means deriving a ¬∀ (NOT ALL=SOME) interpretation, thus accessing a non-isomorphic reading (Neg>UnivQ). On the contrary, rejecting the sentence in the 2/5 context means deriving a ∀¬ (NONE) interpretation, thus accessing an isomorphic reading (UnivQ>Neg).

Our predictions in relation to the specific arrangements or contexts are summarized in Table 11:

| Exp. Item | Lineal Order | Arrangement | Predicted Response | Codification | Interpretation |
|---|---|---|---|---|---|
| ***no todos / ez guztiak* 'not all'** | Neg-UnivQ | 0/5 | Wrong | Isomorphic reading (*some*-reading) | ¬∀ |
| | | 2/5 | Right | Isomorphic reading (*some*-reading) | ¬∀ |
| | | 5/5 | Wrong | Isomorphic reading (*some*-reading) | ¬∀ |
| ***todos no / guztiak ez* 'all not'** | UnivQ-Neg | 0/5 | Right | Isomorphic reading (*none*-reading) | ∀¬ |
| | | 2/5 | Wrong | Isomorphic reading (*none*-reading) | ∀¬ |
| | | 5/5 | Wrong | Isomorphic reading (*none*-reading) | ∀¬ |

Table 11: Predictions SET – Version 2

### 6.3.2 Participants

Regarding the L1Spanish children, data from 14 5-to-6-year-old children were collected in a school located in Iruña (Nafarroa). These children are monolingual speakers of Spanish and they communicate in Spanish both at home and at school. With respect to second languages, they have just started studying English at school.

Regarding the Basque children, data from 25 5-year-old children were collected in a school located in Ordizia (Gipuzkoa). These children are bilingual of Basque and Spanish, but their mother tongue is Basque, and they communicate in Basque both at home and at school. With respect to second languages, they have just started studying English at school.

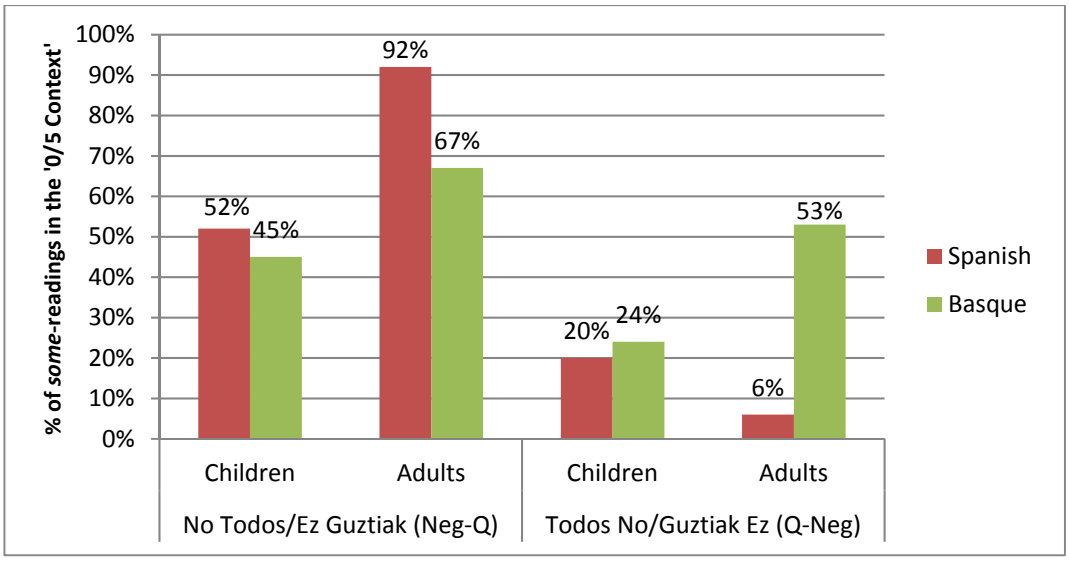
In addition, 10 adult native speakers of Basque and 12 adult native speakers of Spanish were tested as well.

### 6.3.3 Results

These are the results obtained with children and adults with both orders:[22]

As shown in Graph 41, Spanish and Basque children choose in 52% and in 45% of cases (respectively) the *some*-reading when interpreting *no todos/ez guztiak* 'not all' (Neg-UnivQ) in the '0/5 context'. In contrast, when interpreting *todos no/guztiak ez* 'all not' (UnivQ-Neg), they only choose the *some*-reading in 20% and in 24% of cases. As for Spanish and Basque adults, they choose in 92% and in 67% of cases (respectively) the *some*-reading for the Neg-UnivQ order, and for the UnivQ-Neg order, they only choose the *some*-reading in 6% and in 53% of cases.

[22] For the sake of clarity, I will present the results obtained in Version 2 of Experiment 1, together with the results from Version 1 of Experiment 1, in order to compare the rates with both orders.

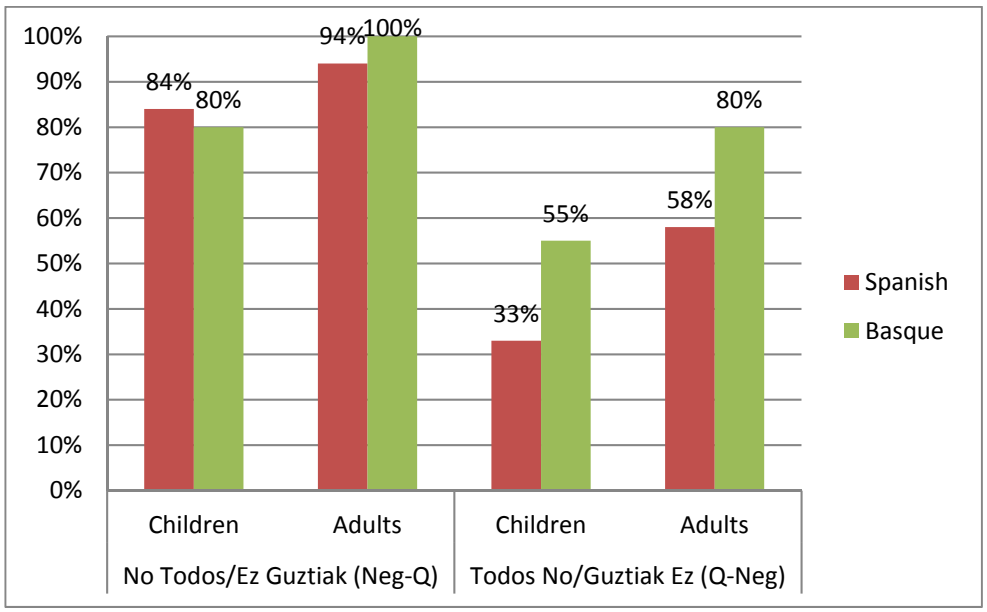



Graph 41: % of *some*-readings in the 0/5 context (rates of rejection)

We find statistically significant inter-group and inter-order differences. With respect to the Neg-UnivQ order, the between-group comparison revealed that there is a significant difference between Spanish children and Spanish adults (t=-3,777; p=0.001); for the UnivQ-Neg order, there are significant differences between Basque children and Basque adults (t=-2,235; p=0.047) and between Spanish adults and Basque adults (t=-3,721; p=0.004). If we compare the two orders, there are significant differences between Spanish children (t=-2,324; p=0.026), between Basque children (t=-2,307; p=0.027) and between Spanish adults (t=-16,057; p=0.000).

As plotted in Graph 42, Spanish and Basque children choose in 84% and in 80% of cases (respectively) the *some*-reading when interpreting *no todos/ez guztiak* 'not all' (Neg-UnivQ) in the '2/5 context'. On the contrary, when interpreting *todos no/guztiak ez* 'all not' (UnivQ-Neg), they only choose the *some*-reading in 33% and in 55% of cases, respectively. Spanish and Basque adults choose in 94% and in 100% of cases (respectively) the *some*-reading for the Neg-UnivQ order. For the UnivQ-Neg order, while Spanish adults choose the *some*-reading in 58% of cases, Basque adults choose it in 80% of cases.

Within this (2/5) context, there are also inter-group and inter-order statistically significant differences. With respect to the Neg-UnivQ order, there is a significant difference between Basque children and Basque adults (t=-2,777; p=0.010). If we compare the two orders, there are significant differences between Spanish children (t=-5,050; p=0.000) and between Spanish adults (t=-2,789; p=0.015).




Graph 42: % of *some*-readings in the 2/5 context (rates of acceptance)

### 6.3.4 Discussion

Participants responses indicate that 5-to-6-year-old Spanish/Basque children do not choose the *some*-reading (thus they choose the *none*-reading) when interpreting *todos no/guztiak ez* 'all not' (UnivQ-Neg) in the '0/5 context'; that is, they rely on the information provided by the surface structure ('the isomorphic reading'). This results support Prediction 2 (see section 6.2), which stated that both L1Spanish and L1Basque children would obtain a *none*-reading when interpreting *todos no/guztiak ez* 'all not' (UnivQ-Neg) (i.e. 'Todas las manzanas no están en las cajas' for Spanish and 'Sagar guztiak ez daude kutxetan' for Basque).

When the reversed order (Neg-UniQ) is tested in the '0/5 context', children obtain higher percentages of the *some*-reading, fact which goes in line with Predictions 1 and 3, which stated that both L1Spanish and L1Basque children would obtain a *some*-reading when interpreting the order UnivQ-Neg (i.e. 'No todas las manzanas están en las cajas' for Spanish and 'Ez daude sagar guztiak kutxetan' for Basque).

From the above results, it is clear that children are sensitive to the position of Neg in the surface structure and to the different orders tested. This sensitivity to the position of Neg with respect to the quantifier *todos/guztiak* can also be observed in the '2/5 Context'. In this context, Spanish and Basque children obtain lower percentages of the *some*-reading (33% and 50%, respectively) when the UnivQ takes scope over Neg. This fact again goes in favor of Prediction 1.

While there are no significant differences between Spanish and Basque children in neither of the two conditions, the interesting fact about the results is that there are differences between Spanish and Basque adults, significant in the '0/5 context'. For the Neg-UnivQ order, both adult groups clearly prefer the *some*-reading (i.e. high rates of rejection in the '0/5' context and high rates of acceptance in the '2/5' context), which indeed reflects an isomorphic reading.

For the UnivQ-Neg order, Spanish adults choose the *some*-reading in the '0/5' context in a range of 0% - 17% of cases, what means that they clearly prefer a *none*-reading (isomorphic reading). In contrast, 5 of the 10 Basque adults choose the *some*-reading in a 17% of cases and the other 5 in a range of 83% - 100% cases, what means that they accept both the *some* (non-isomorphic) and the *none* (isomorphic) readings (it wil be further discussed in Chapter 8).

## 6.4 PICTURE SELECTION TASK (EXPERIMENT 2)

It has already been observed (see section 6.3) that (i) 5-to-6-year-old L1Spanish children and L1Spanish adults tend to obtain a *some*-reading when interpreting *no todos* 'not all' (Neg-UnivQ), and (ii) that they obtain a *none*-reading when interpreting *todos no* 'all not' (UnivQ-Neg); (iii) 5-to-6-year-old L1Basque children and L1Basque adults tend to obtain as well a *some*-reading when interpreting *ez guztiak* 'not all' (Neg-UnivQ), but (iv) while L1Basque children tend to obtain a *none*-reading when interpreting *guztiak ez* 'all not' (UnivQ-Neg), (v) L1Basque adults show no preference for one reading over the other.

These results were obtained through a Sentence Evaluation Task (SET) (adaptation from Katsos et al. 2012), where the participants were asked to evaluate whether the sentences produced by a puppet (i.e. The Cavegirl) were accurate to the pictures presented on a computer. With this experiment, participants evaluated if they accepted or rejected a specific reading, but they could not express their preference for one reading over the other (i.e. *some*-reading vs. *none*-reading). In addition, the participants (especially children) could have developed the tendency to accept the utterances, instead of rejecting them (i.e. a *yes*-bias; Ambridge & Rowland 2013).

Therefore, in order to know if the results obtained were influenced by the methodology (i.e. if there was a task effect; see Schmitt & Miller 2010) and to analyze the participants' preference for a reading over the other, a Picture Selection Task (PST) was developed (employing the sentences and the pictures from Katsos et al. 2012).

### 6.4.1 Specific Research Questions

Based on the results obtained in the SET, these are our specific research questions for the PST:

(i) Will we replicate in the PST the results obtained in the SET, or will we find a task-effect?
(ii) Will L1Spanish children and adults behave similarly in the PST as well?
(iii) Will we observe the same variability among L1Basque children and adults in the PST as well?
(iv) Will the "Observation of Isomorphism" (Musolino 1998; Musolino et al. 2000) account for the results obtained in the PST?

### 6.4.2 Specific Predictions

Taking into account the results obtained in the SET, these are our predictions for the PST:

(I) We expect L1Spanish children
  (a) to obtain a *some*-reading when interpreting *no todos* 'not all'.
  (b) to obtain a *none*-reading when interpreting *todos no* 'all not'.

(II) We expect L1Spanish adults
  (a) to obtain a *some*-reading when interpreting *no todos* 'not all'.
  (b) to obtain a *none*-reading when interpreting *todos no* 'all not'.

(III) We expect L1Basque children
  (a) to obtain a *some*-reading when interpreting *ez guztiak* 'not all'.
  (b) to obtain a *none*-reading when interpreting *guztiak ez* 'all not'.

(IV) We expect L1Basque adults

(a) to obtain a *some*-reading when interpreting *ez guztiak* 'not all'.

(b) to show no preference for one reading over the other when interpreting *guztiak ez* 'all not'.

### 6.4.3 Method

A Picture Selection Task (PST) was developed, employing the sentences and the pictures from Katsos et al. 2012 (Versions 1 and 2 of the SET). Participants were asked to choose one of two pictures presented on a screen, after hearing an utterance produced by a puppet, i.e. The Cavegirl. It was a forced-choice task, thus participants were expected to choose the picture which best suited each utterance.

The two pictures presented on each slide represented two different contexts:

- '0/5 context': here 0 out of 5 objects are inside the boxes (further interpreted as the *none*-reading).
- '2/5 context': here 2 out of 5 objects are inside the boxes (further interpreted as the *some*-reading).

12 utterances were produced for the quantifier *no todos / ez guztiak* 'not all' (Neg-UnivQ), and another 12 utterances for the quantifier *todos no* / *guztiak ez* 'all not' (UnivQ-Neg). In order to avoid spacial numerical association of response codes (Dehaene et al. 1983; Fischer 2003), with each quantifier, 6 utterances were produced in a visual-setting where the '0/5 context' was on the left-side and the '2/5 context' on the right-side of the screen (see Figure 14), and the other 6 utterances were produced in a visual-setting where the '2/5 context' was on the left-side and the '0/5 context' on the right-side of the screen (see Figure 15).

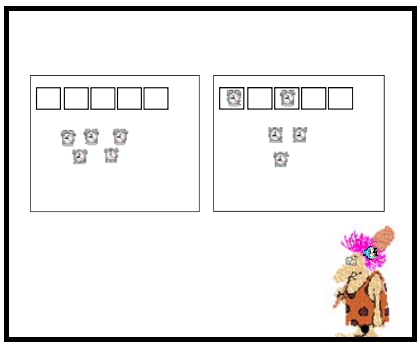


Figure 14: 0/5 & 2/5 contexts

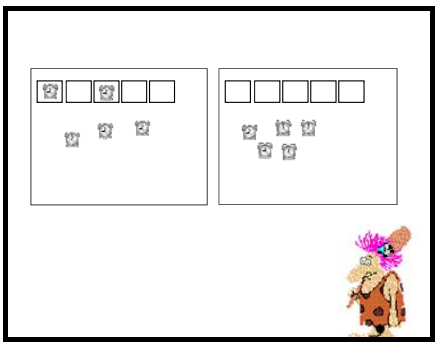


Figure 15: 2/5 & 0/5 contexts

The utterances produced for the quantifiers *no todos / ez guztiak* 'not all' and the ones produced for the quantifiers *todos no* / *guztiak ez* 'all not' were like the sentences in Version 2 of EXPERIMENT 1.

Apart from the 24 test items (12 for each quantifier), there were 5 training items with numerals (at the beginning of the experiment), 8 distractors and 24 fillers (61 slides in total). Within the fillers, there were 12 items which tested the quantifier *algunos / batzuk* 'some', and another 12 which tested the quantifier *ninguno / bat ere ez* 'none'.

As with the test items, both with *algunos / batzuk* 'some' and with *ninguno / bat ere ez* 'none', 6 fillers were produced in a visual-setting where the '0/5 context' was on the left-side and the '2/5 context' on the right-side of the screen, and the other 6 fillers were produced in a visual-setting where the '2/5 context' was on the left-side and the '0/5 context' on the right-side of the screen.

In Table 12 the (number of) experimental items, their linear order and the possible chosen pictures (from the different picture pairs), together with their codification and interpretation is presented.

| Exp. Item | Lineal Order | Nº of Items | Picture Pair | Chosen Picture | Interpretation | Codification |
|---|---|---|---|---|---|---|
| ***todos no* / *guztiak ez* 'all not'** | UnivQ-Neg | 12 (6+6) | 0/5 - 2/5 or 2/5 - 0/5 | 0/5 | ∀¬ | Isomorphic reading |
| | | | | 2/5 | ¬∀ | Non-isomorphic reading |
| ***no todos* / *ez guztiak* 'not all'** | Neg-UnivQ | 12 (6+6) | 0/5 - 2/5 or 2/5 - 0/5 | 0/5 | ∀¬ | Non-isomorphic reading |
| | | | | 2/5 | ¬∀ | Isomorphic reading |

Table 12: Picture Selection Task (PST)

When the order UnivQ-Neg (*todos no* / *guztiak ez* 'all not') is tested, choosing the 0/5 picture is interpreted as deriving a ∀¬ (NONE) interpretation, thus accessing in this case an isomorphic reading (UnivQ>Neg). On the contrary, choosing the 2/5 picture is interpreted as deriving a ¬∀ (NOT ALL=SOME) interpretation, thus accessing a non-isomorphic reading (Neg>UnivQ).

When the order Neg-UnivQ (*no todos* / *ez guztiak* 'not all') is tested, choosing the 0/5 picture is interpreted as deriving a ∀¬ (NONE) interpretation, thus accessing a non-isomorphic reading (UnivQ>Neg). On the contrary, choosing the 2/5 picture is interpreted as deriving a ¬∀ (NOT ALL=SOME) interpretation, thus accessing an isomorphic reading (Neg>UnivQ).

### 6.4.4 Participants

Regarding the Spanish children, data from 25 5/6-year-old children were collected in a school located in Iruña (Nafarroa). These children are monolingual speakers of Spanish and they communicate in Spanish both at home and at school. With respect to second languages, they have just started studying English at school.

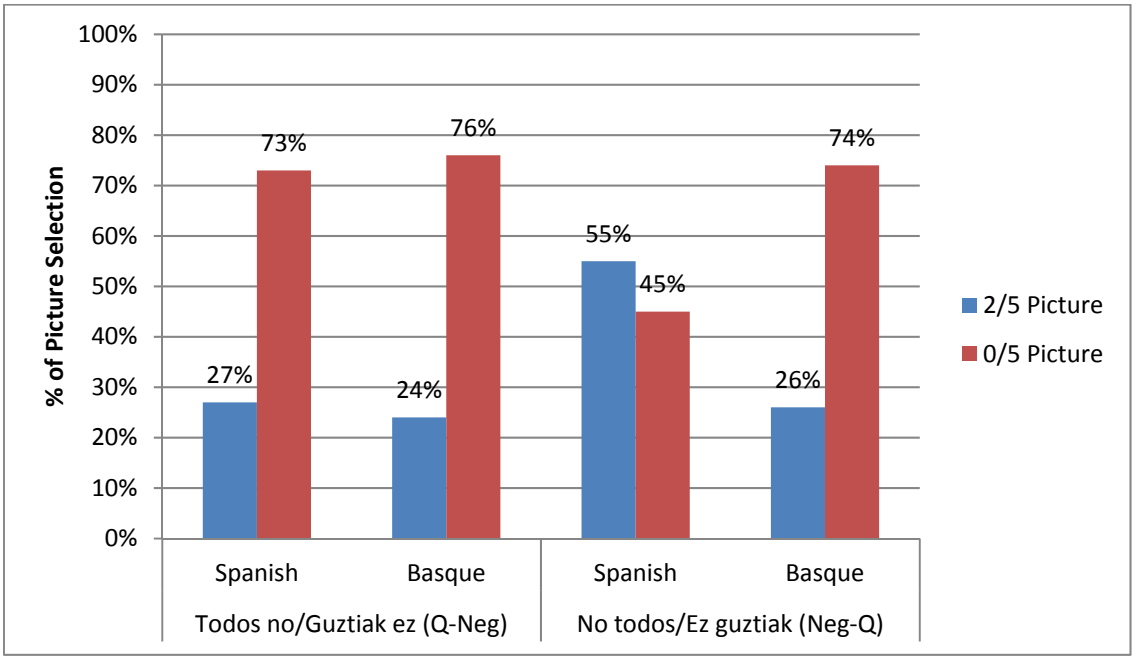
Regarding the Basque children, data from 27 5/6-year-old children were collected in a Basque school located in Ordizia (Gipuzkoa) and in a Basque school located in Ibarra (Gipuzkoa).

These children are bilingual of Basque and Spanish, but their mother tongue and their dominant language is Basque, because they communicate in Basque both at home and at school. With respect to second languages, they have just started studying English at school.

In addition, 22 adult native speakers of Basque and 17 adult native speakers of Spanish were tested as well.

### 6.4.5 Results

The results obtained with 5-to-6-year-old L1Basque and L1Spanish children with *todos no* / *guztiak ez* 'all not' (UnivQ-Neg) and with *no todos / ez guztiak* 'not all' (Neg-UnivQ) are plotted in Graph 43:




Graph 43: Spanish and Basque Children's % of Picture Selection

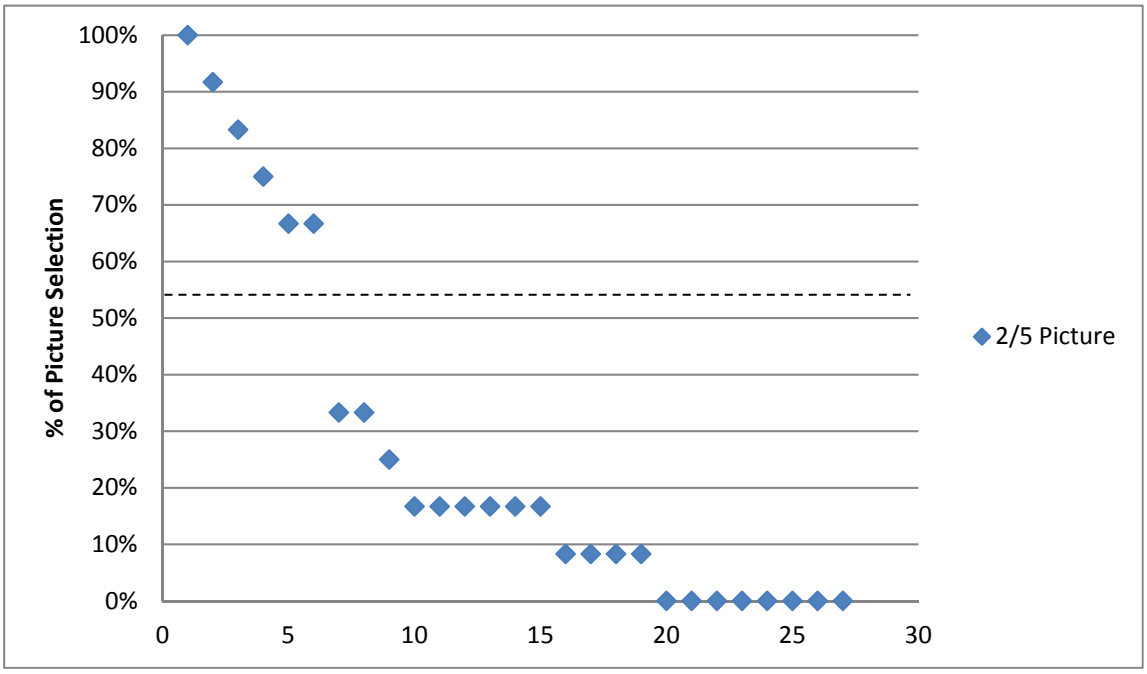
In Graph 43 it can be observed that for *todos no* 'all not' L1Spanish children choose the 0/5 picture in 73% of cases. In the same line, for *guztiak ez* 'all not' L1Basque children choose the 0/5 picture in a 76% of cases. Thus, a preference for the 0/5 picture (isomorphic *none*-reading) with the order UnivQ-Neg is observed in both languages with children. For this UnivQ-Neg order, inferential tests reveal that there are significant differences between the mean rates of picture selection by Spanish children (t(24)=-3,558; p= 0,002), and between the mean rates of picture selection by Basque children (t(26)=-4,453; p= 0,000).

When the reversed order between the quantifier and the negative operator is tested (Neg-UnivQ), it can be observed that for *no todos* 'not all' L1Spanish children choose the 2/5 picture in 55% of cases (isomorphic *some* reading) and the 0/5 picture in 45% of cases (non-isomorphic *none* reading). Contrary to these results, for *ez guztiak* 'not all' L1Basque children choose the 0/5 picture in 74% of cases (non-isomorphic *none* reading). Thus, based on the mean scores shown in Graph 43, it can be observed that while a preference for the 0/5 picture (non-isomorphic *none*-reading) with the order Neg-UnivQ is observed with L1Basque children, no clear preference for one picture over the other can be seen with L1Spanish children. For this Neg-UnivQ order, inferential tests reveal that there are only significant differences between the mean rates of picture selection by Basque children (t(26)=-3,891; p= 0,001).

When the orders (UnivQ-Neg vs. Neg-UnivQ) are compared, inferential tests reveal that are only significant differences between the mean rates of Spanish children (t(24)=-4,799; p=000). When the language groups are compared, there are only significant differences with the Neg-UnivQ order (t(50)=-3.130; p=0.003).

On top of the comparison of the mean rates, we believe it is important to analyze the individual differences, since if we only concentrate on the overall

mean rates, we can miss important information about the preferences and the development of children's readings. When we analyse in detail the percentage of selection of the 2/5 picture with *ez guztiak* 'not all' by L1Basque children and with *no todos* 'not all' by L1Spanish children (the order in which more heterogeneous data are observed), the following results can be observed (see Graphs 44 and 45; and Tables 13 and 14 for the ranges):



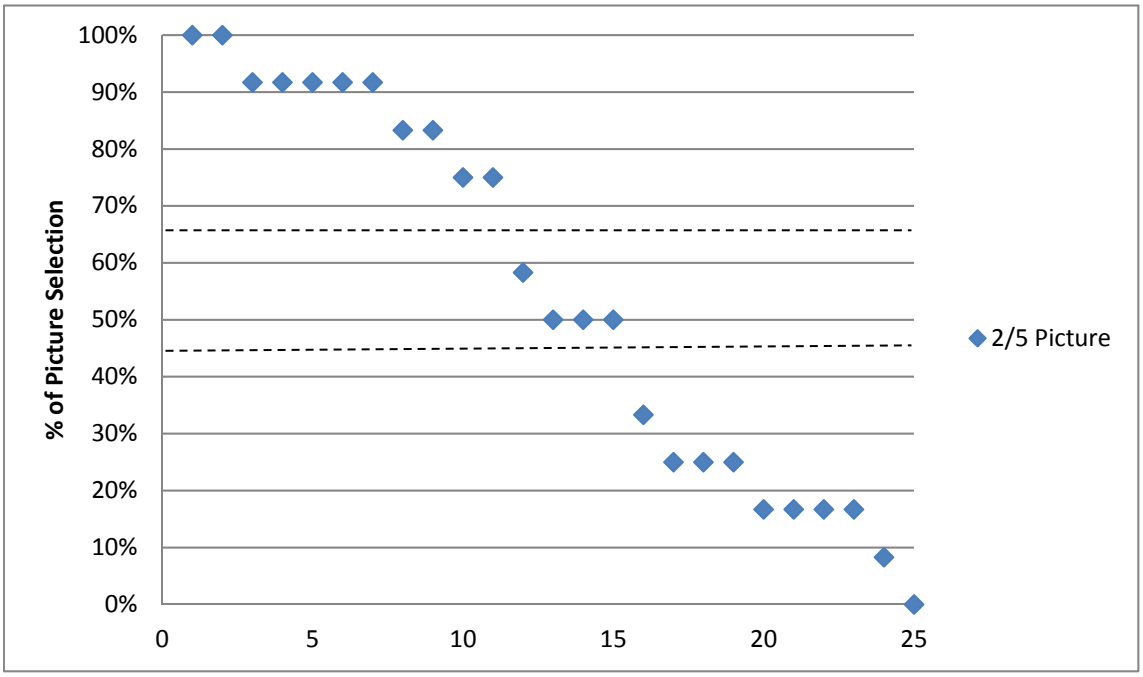

Graph 44: Basque Children's % in the Selection of the 2/5 Picture with *ez guztiak* 'not all' (Neg-UnivQ)

| Number of Children | 2/5 Picture - Ranges |
|---|---|
| 6 | <100%-66,70%> |
| 21 | <33,30%-0%> |

Table 13: Basque Children's Ranges in the Selection of the 2/5 picture

In Graph 44 and Table 13 it can be observed that while 6 L1Basque children choose the 2/5 picture for *ez guztiak* 'not all' between 100% and 66,7% of cases, 21 of them choose it between 33,3% and 0% of cases. This means that

the majority of the L1Basque children choose the 0/5 picture for *ez guztiak* 'not all' (which is indeed the non-isomorphic *none* reading).




Graph 45: Spanish Children's % in the Selection of the 2/5 Picture with *no todos* 'not all' (Neg-UnivQ)

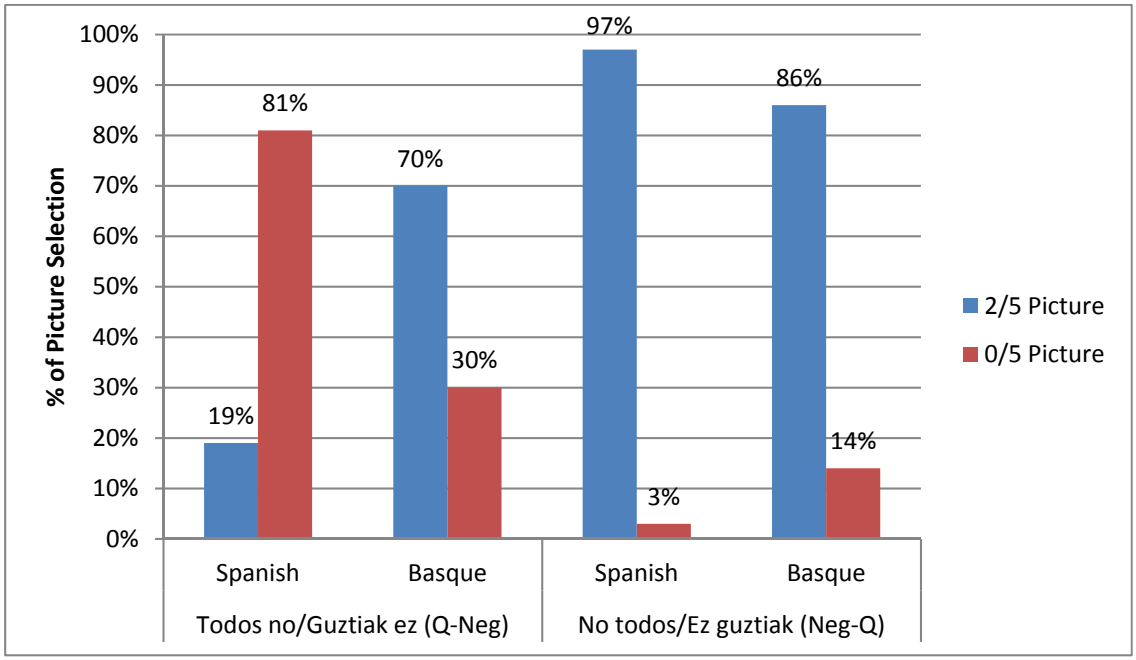
| Number of Children | 2/5 Picture - Ranges |
|---|---|
| 11 | <100%-75%> |
| 4 | <58,30%-50%> |
| 10 | <33,30%-0%> |

Table 14: Spanish Children's Ranges in the Selection of the 2/5 picture

In Graph 45 and Table 14 it can be observed that 11 L1Spanish children choose the 2/5 picture for *no todos* 'not all' between 100% and 75% of cases, 4 of them choose it between 58,3% and 50% of cases and 11 of them between 33,3% and 0% of cases. This means that (except for 4 children, who show no preference for one picture over the other) half (n=11) of the L1Spanish children choose the 2/5 picture for *no todos* 'not all' (isomorphic *some* reading) and the other half (n=10) the 0/5 picture (non-isomorphic *none* reading).

These dispersion Graphs (44 and 45) indicate that while the majority of the L1Basque children choose the non-isomorphic *none* reading for *ez guztiak* 'not all', a bimodal distribution between the two readings (isomorphic *some* reading and non-isomorphic *none* reading) can be observed with L1Spanish children.

These are the results obtained with L1Basque and L1Spanish adults with *todos no* / *guztiak ez* 'all not' (UnivQ-Neg) and with *no todos* / *ez guztiak* 'not all' (Neg-UnivQ):




Graph 46: Spanish and Basque Adults' % of Picture Selection

In Graph 46 it can be observed that for *todos no* 'all not' L1Spanish adults choose the 0/5 picture in a 81% of cases. Contrary to these results, for *guztiak ez* 'all not' L1Basque adults choose the 2/5 picture in a 70% of cases. Thus, while a preference for the 0/5 picture with the order UnivQ-Neg is observed with L1Spanish adults, a preference for the 2/5 picture with the same order is observed with L1Basque adults. For this UnivQ-Neg order, inferential tests reveal that there are significant differences between the mean rates of picture

selection by Spanish adults (t(16)=-4,976; p= 0,000), and between the mean rates of picture selection by Basque adults (t(21)=3,011; p= 0,007).

With the reversed order between the quantifier and the negative operator (Neg-UnivQ), it can be observed that for *no todos* 'not all' L1Spanish adults choose the 2/5 picture in a 97% of cases. In the same line, for *ez guztiak* 'not all' L1Basque adults choose the 2/5 picture in a 86% of cases. Thus, a preference for the 2/5 picture with the order Neg-UnivQ is observed in both languages with adults. In fact, for this Neg-UnivQ order, inferential tests reveal that there are significant differences between the mean rates of picture selection by Spanish adults (t(16)=32,123; p= 0,000), and between the mean rates of picture selection by Basque adults (t(21)=6,385; p= 0,000).

When the orders (UnivQ-Neg vs. Neg-UnivQ) are compared, inferential tests reveal that there are significant differences not only between the mean rates of Spanish adults (t(16)=-12,653; p=000), but also between the mean rates of Basque adults (t(21)=-2,855; p=0,009). Therefore, although Basque adults choose in 70% and in 86% of cases the 2/5 picture for the UnivQ-Neg and Neg-UnivQ orders (respectively), there is a significant difference between those rates. When the language groups are compared, there are significant differences with both the UnivQ-Neg order (t(37)=36,870; p=0,000) and with the Neg-UnivQ order (t(37)=24.041; p=0.033).

### 6.4.6 Discussion

Prediction (Ia) stated that L1Spanish children would obtain a *some* reading when interpreting *no todos* 'not all', but that does not hold. In fact, we have observed that (except for 4 children, who show no preference for one picture over the other) half (n=11) of the L1Spanish children choose the 2/5 picture for *no todos* 'not all' (isomorphic *some* reading) and the other half (n=10) the 0/5 picture (non-isomorphic *none* reading).

Prediction (IIIa) said that L1Basque children would obtain a *some* reading when interpreting *ez guztiak* 'not all', but this is not the case. Indeed, the majority of the L1Basque children (21 out of 27) choose the 0/5 picture (non-isomorphic *none* reading) for *ez guztiak* 'not all'.

Prediction (IVb) claimed that L1Basque adults would show no preference for one reading over the other when interpreting *guztiak ez* 'all not', but this does not hold either. In fact, for *guztiak ez* 'all not' L1Basque adults choose the 2/5 picture (*some* reading) in 71% of cases.

The interpretations of the adults are quite homogeneous: when being exposed to the order Neg-UnivQ, both L1Spanish and L1Basque adults obtain a majority of *some*-readings. When the reversed order UnivQ-Neg is tested, L1Spanish adults obtain a *none*-reading for *todos no* 'all not' (an isomorphic reading in this case), but L1Basque adults obtain a *some* reading for *guztiak ez* 'all not' (a non-isomorphic reading in this case)[23]. However, the interpretations of the children are not so homogeneous: in particular, when being exposed to the order Neg-UnivQ, L1Basque children obtain a non-isomorphic *none*-reading, but half (n=11) of the L1Spanish children obtain an isomorphic *some* reading and the other half (n=10) a non-isomorphic *none* reading for *no todos* 'not all'. When the reversed order UnivQ-Neg is tested, both L1Spanish and L1Basque children obtain an isomorphic *none*-reading (it wil be further discussed in Chapter 8).

In Tables 15, 16, 17 and 18 the mean scores of L1Spanish and L1Basque children and adults in the SET and the PST are plotted:

[23] Though statistically significant from the other order Neg-UnivQ.

| | UnivQ-Neg | Neg-UnivQ |
|---|---|---|
| **Children** | 76% | 55% |
| **Adults** | 47% | 33% |

Table 15: Basque - SET %*none* acceptance

| | UnivQ-Neg | Neg-UnivQ |
|---|---|---|
| **Children** | 76% | 74% |
| **Adults** | 30% | 14% |

Table 16: Basque - PST %*none* preference

| | UnivQ-Neg | Neg-UnivQ |
|---|---|---|
| **Children** | 80% | 48% |
| **Adults** | 94% | 8% |

Table 17: Spanish- SET %*none* acceptance

| | UnivQ-Neg | Neg-UnivQ |
|---|---|---|
| **Children** | 73% | 45% |
| **Adults** | 81% | 3% |

Table 18: Spanish - PST %*none* preference

If we contrast the results obtained in the SET with those in the PST, the most remarkable differences are the following ones:

In the case of Basque, children's percentage of *none*-readings in the Neg-UnivQ condition is higher in the PST than in the SET (from 55% to 74%), what means that they prefer in a higher rate the 0/5 picture for *ez guztiak*, i.e. a non-isomorphic reading. Another important aspect to consider is that Basque adult's percentage of *none*-readings is reduced in both the UnivQ-Neg and Neg-UnivQ conditions from the SET to the PST (47% to 30% and 33% to 14%, respectively). This means that when preference is tested, Basque adults' tendency is to interpret both UnivQ-Neg and Neg-UnivQ as Neg having scope over UnivQ, that is, a *some*-reading (in line with Etxeberria (2012) and further discussed in Chapter 8).

In the case of Spanish, we can observe that the percentage of *none*-readings in the UnivQ-Neg condition is slightly reduced with children from the SET to the PST (80% to 73%) and also with adults (94% to 81%). However, the percentages are high in both age populations, what implies a clear tendency to interpret *todos no* as *ninguno* in Spanish both in acceptance and preference experimental tasks.

# CHAPTER 7: THE INTERPRETATION OF WEAK QUANTIFIERS BY EARLY BILINGUAL CHILDREN

In this chapter, (i) the Bilingual study is presented, and (ii) HYP4, RQ4 and Prediction 4 are tested, repeated here for the reader's convenience:

**HYPOTHESIS:**

HYP4. There is no bilingual advantage as regards the derivation of SIs (Siegal et al. 2007; Antoniou et al. 2013; Syrett et al. 2017).

**RESEARCH QUESTION:**

RQ4. Is there a bilingual advantage as regards the derivation of SIs (Siegal et al. 2007; Antoniou et al. 2013; Syrett et al. 2017)?

**PREDICTION:**

PREDICTION 4: THE LINGUISTIC PROFILE OF THE CHILDREN WILL NOT AFFECT THE DERIVATION OF SIS.

In previous chapters we have been describing and analyzing First Language Acquisition (FLA) data, but we cannot obviate the fact that Basque-speaking children in the Basque Country of Spain are indeed bilingual children who also understand (and speak) Spanish. In this chapter we are going to tackle the concept of bilingualism from a general perspective (section 7.1.1) to concentrate afterwards on the literature on the acquisition of Scalar Implicatures (SI) by bilingual children (section 7.1.2). In section 7.2 the Bilingual study will be presented. In section 7.3 the obtained results will be discussed in relation to the literature and in section 7.4 a general conclusion will be given.

## 7.1 INTRODUCTION

### 7.1.1 Bilingualism

Bilingualism has aroused much interest in the last three decades and different definitions have been given to the terms "bilingual" and "bilingualism". Grosjean & Li (2013) define bilingualism "as the use of two or more languages (or dialects) in everyday life" (p. 5). In this chapter we are going to focus on child bilingualism and, specifically, on bilingual early child language acquisition.

Grosjean & Li (2013) understand "early childhood" as "the preschool years up to around age 5" (p. 120), whereas Montrul (2008) extends that period to 12 years of age. In any case, this "early" stage of Language Acquisition (LA) represents a more complex picture if we are dealing with Bilingual Language Acquisition (BLA). Within BLA, distinct linguistic profiles can be observed: (i) simultaneous BLA (2L1: $L_a$ & $L_\alpha$) and (ii) successive or sequential BLA (L1 & L2). The limit as to when BLA turns from simultaneous to successive or sequential has been put at different stages; MacLaughin (1978), for instance, established that limit at age 3. As there is no consensus on the definition of simultaneous BLA or Bilingual First Language Acquisition (BFLA) as regards the age-limit, we are going to us the term "simultaneous bilinguals" for those children whose exposure to both languages begins within the first year of life, as proposed by Deuchar & Quay (2000).

The exposure to a language is of vital importance not only from a quantitative but also from a qualitative point of view. In fact, the quality of the input is so important as the amount of input children are exposed to. Bilingual children face an additional challenge, as compared to monolingual children: they are exposed to two distinct language systems and the input received is not always 50-50. As Grosjean & Li (2013; p. 122) explain, the "Poverty of Stimulus" (as related to "Plato's Problem" or "The Logical Problem of Language Acquisition);

Chomsky 1980) can be renamed as the "Poverty of Dual Stimulus" (Yip & Mathews 2007; p. 30).

The type of input and the language use in a daily basis have an effect on the language dominance. In fact, in many cases, early bilingual children have a greater dominance in one of their languages, leading to an unbalanced development of their two languages; hence the distinction between balanced and unbalanced bilinguals. Unbalanced bilingualism is many times confused with passive bilingualism, where a child may understand (competence) two languages but just produce (performance) one of them.

From a conceptual point of view, different theories have been proposed as to whether bilingual children develop completely separate linguistic systems or if there is cross-linguistic influence. Volterra & Taeschner (1978) proposed that a single system underlies both languages, in contrast to "The Separate Development Hypothesis" by De Houwer (1990, 2009), who supports the idea that the child develops two separate and independent systems. Besides, the crosslinguistic influence view (Döpke 2000; Yip & Mathews 2007; Hulk & Muller 2000) states that children develop two distinct linguistic systems, but they can influence each other. Other authors (Costa 2005; Kroll & Stewart 1994) have proposed that bilinguals share a conceptual system for their two languages, rather than distinct lexical entries.

On top of the previously described aspects of bilingualism, the context where bilingual children are raised defines the types of bilinguals we can encounter. It is for this reason that the sociolinguistic context of the Basque Country of Spain was described in Chapter 3.

In the next section (7.1.2) the studies on the acquisition of SIs will be described, before we present our study on the acquisition of SIs by Basque-dominant Basque-Spanish bilingual children (section 7.2).

### 7.1.2 SIs in early bilingual children (2L1)

Most of the studies on the derivation of SIs (Noveck 2001, 2004; Guasti et al. 2005; Katsos et al. 2016; a.o.) have focused on monolingual children, but few of them have investigated this phenomenon with bilingual children (Siegal et al. 2007; Antoniou et al. 2013; Syrett et al. 2017) and they have drawn different conclusions:

(i) bilingual children show enhanced pragmatic abilities as compared to monolingual children (Siegal et al. 2007);
(ii) there is no solid evidence in favor of a bilingual advantage as regards the derivation of SIs (Antoniou en al. 2013, Syrett et al. 2017).

Taking into account the previous observation that bilingual children are more sensitive to the communicative context (Genesee et al. 1995), Siegal et al. (2007) predicted that bilingual children would obtain more adult-like results than monolingual children in tasks on the derivation of SIs. This prediction was formulated within the classical Gricean framework (1975, 1989) and, more specifically, in obedience to the "maxim of quantity" of the "Cooperative Principle". Siegal et al. (2007) analyzed the sensitivity to SIs with 21 English monolingual children, 23 Japanese monolingual children and 20 English-Japanese bilingual children, all of them being 4-to-6 years of age. The experiment, adapted from the material employed by Papafragou & Musolino (2003), was presented in the respective native languages of the monolingual children and only in Japanese to bilingual children. The participants had to evaluate if the description of an event given by a puppet ('The Cavegirl') was adequate or not. The critical items were those under-informative descriptions given by the puppet, such as using *algunos* 'some' in a *todos* 'all' context. The results, correlated with measures of the participants' linguistic competence, pointed to a strong bilingual advantage. The fact that the results in linguistic

competence were significantly worse with bilinguals as compared to monolinguals led Siegal et al. (2007) to conclude that the observed bilingual advantage had no linguistic basis.

Employing a similar experiment and method as that from Siegal et al. (2007), Antoniou et al. (2013) obtained different results. Antoniou et al (2013) compared 36 bidialectal children of Cypriot Greek and standard modern Greek (mean age=8;5) to 20 multilingual children of Cypriot Greek, standard modern Greek and one or two additional languages (mean age=8;8) and found no significant differences between the performance of the two groups.

Syrett et al. (2017) carried out two experiments: a variation of the sentence evaluation task employed by Noveck (2001) and a picture selection task. In the first experiment, the participants were 27 Spanish-English bilingual children (mean age=4;7), 20 Spanish-monolingual children from Perú (mean age=4;1) and 19 Spanish native-speakers. In the second experiment, the participants were 36 Spanish-English bilingual children (mean age=4;4), 34 Spanish-monolingual children from Spain (mean age=5;0), 22 Spanish-monolingual children from Perú (mean age=4;1) and 19 Spanish native-speakers. The results from the two studies led Syrett et al. (2017) to the conclusion that both monolingual and bilingual children are confronted to the same challenges when they are asked to use their pragmatic abilities in a discursive context.

## 7.2 STUDY

The Basque Country of Spain offers the possibility to study the pragmatic abilities of bilingual children (as far as the derivation of SIs with quantifiers is concerned), as it represents a contact situation of two typologically distinct languages: Basque and Spanish.

Taking into account the studies described in section 7.1.3, this study aims to answer two fundamental specific Research Questions (RQ) (section 7.2.1) and test a series of specific predictions (section 7.2.2), by means of a SET, whose methodology and main results are described in 7.2.3 and 7.2.4, respectively.

### 7.2.1. Specific Research questions

RQ1. 2L1 vs. 1L1: Do early bilingual children derive more SIs tan monolingual children?

RQ2. Early bilingual children: $L_a$ vs. $L_\alpha$: Do early bilingual children differentiate in their two languages?

### 7.2.2. Specific Predictions

Prediction 1. If differences were found between monolingual and bilingual children, and between the two languages of bilinguals, this would indicate that (for the simple analyzed in this study) the type of linguistic profile and the dominance in a language have an impact on the derivation of SIs with the quantifiers studied.

Prediction 2. If no differences were found between monolingual and bilingual children, nor between the two languages of bilinguals, this would indicate the presence of a (pragmatic deficit) pattern, regardless of a possible convergence between monolinguals and bilinguals and between the two languages of bilinguals.

### 7.2.3 Methodology

7.2.3.1 Instrument and design

This study analyzes the semantic and pragmatic comprehension of the quantifiers *algunos* and *batzuk* by 5-to-6-year-old children and adults (as

controls). The instrument was the same employed for EXPERIMENT 1 (Chapter 4, section 4.1): Version 1 of the SET. Data for *la mayoría/gehienak* 'most' and for negated quantifiers were also collected, but in this chapter we are going to concentrate on the results obtained with *algunos/batzuk* 'some'. The quantifiers presented in this chapter (*algunos* and *batzuk*) are the nearest equivalents in the quantifier inventory of each language and they are the most frequently and naturally used ones by native speakers. This does not mean their morphosyntactic features to be the same, but they do share an equivalent meaning and a similar scalar position from a conceptual perspective.

#### 7.2.3.2 Participants

A total of 74 participants took part in this study: (i) a Basque dominant Spanish-Basque bilingual group (n=13; mean age=5;7) from Ordizia (Gipuzkoa) was tested in its two languages; (ii) a Spanish monolingual group (n=14; mean age=5;6) from Iruña (Nafarroa) was tested in Spanish; and (ii) a L1 Basque group (n=20; mean age=5;1) from Ordizia (Gipuzkoa) was tested in Basque, in order to (1) know their knowledge about the semantic-pragmatic meaning of the quantifiers *batzuk* and *algunos* and to (2) compare (i) bilinguals' interpretations with those of monolinguals and (ii) bilinguals' interpretations in their two languages. [24] Their results were also compared to a group of Spanish adult native controls (n=10) and a group of Basque adult native controls (n=17).

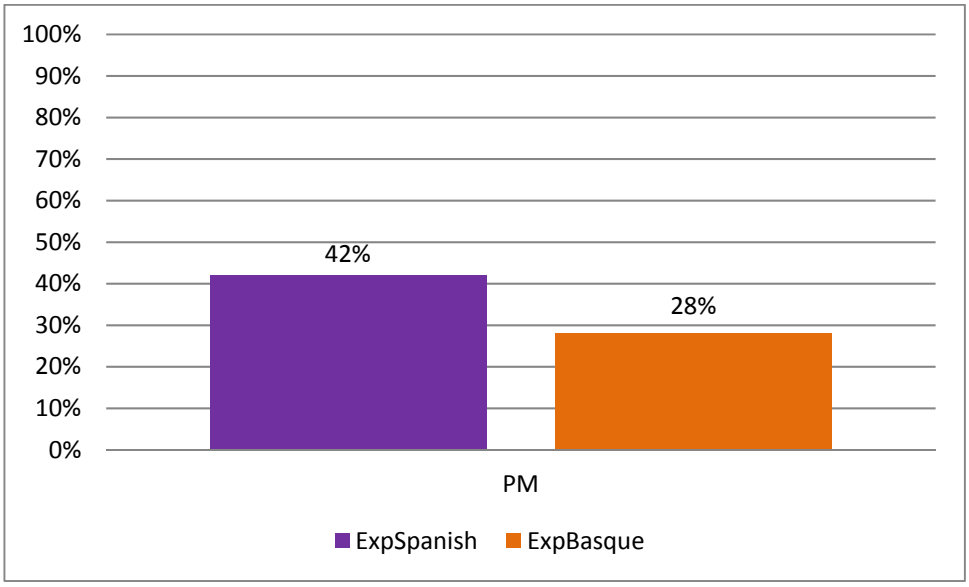
### 7.2.4 Results

As the results obtained with the Semantic Meaning (SM) of the quantifiers *algunos* and *batzuk* are very similar between the three groups of children (*algunos*, L1Spanish=89%; *batzuk*, L1Basque=84%; *algunos*, 2L1=90%; *batzuk*,

[24] In contrast to Spanish monolingual children, L1Basque children are not Basque monolingual children, since that linguistic profile does not exist in the Basque Country of Spain (section 3.3). L1Basque children are Basque-dominant (due to their sociolinguistic context), but they understand (and speak) Spanish.

2L1=90%) and that of adults (*algunos*, L1Spanish=100%; *batzuk*, L1Basque=97%), we are going to restrict our analysis to the results obtained with the Pragmatic Meaning (PM). In fact, PM results show a greater variability and reflect the critical condition of our study (i.e. 5/5 context).

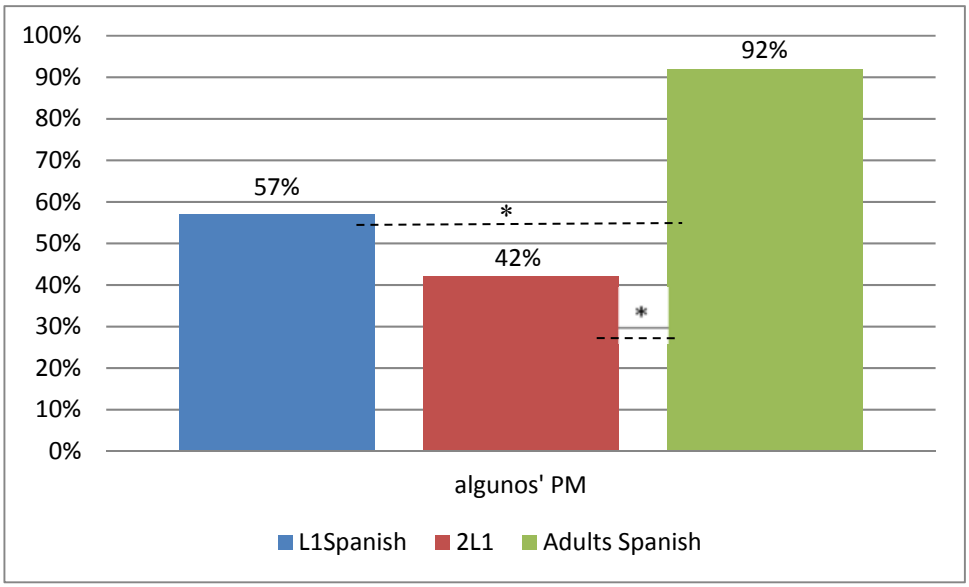
In Graph 47 the percentages of rejection to the quantifiers *algunos* and *batzuk* can be observed in the 5/5 context (underinformative use) by bilingual children in the Spanish and Basque experiments, respectively. Inferential tests indicate that the difference in the results of bilingual children between the Spanish experiment (mean=42%) and the Basque experiment (mean=28%) is not statistically significant ($t(24)=0.806$, $p>0.05$).




Graph 47: Rejection of *algunos/batzuk* 'some' in 5/5 - 2L1 children

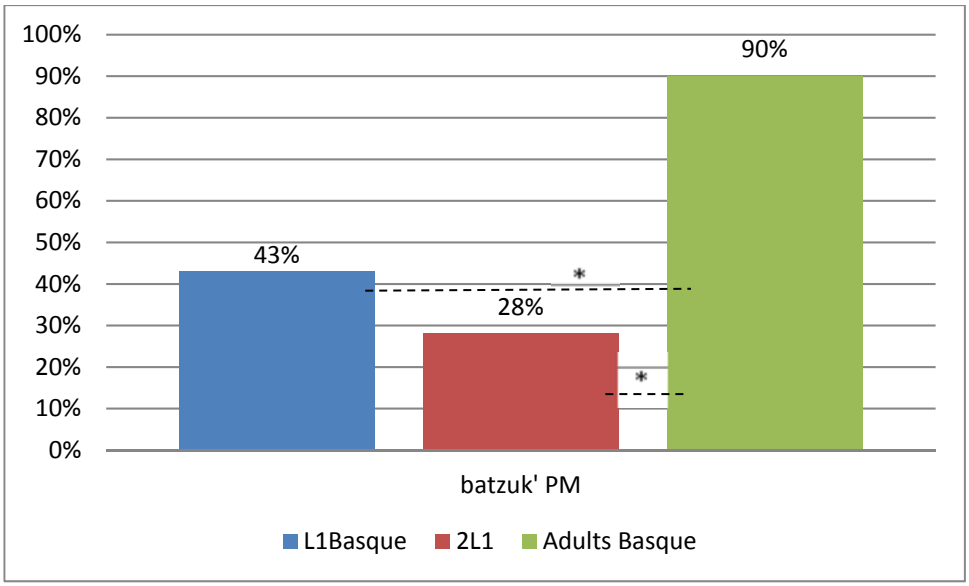
In Graph 48 the percentages of rejection to the quantifier *algunos* can be observed in the 5/5 context (underinformative use) of the Spanish experiment by Spanish monolingual children, by bilingual children and by L1 Spanish adults, respectively. Inferential tests reveal that: (i) the difference in the results between Spanish monolingual children (mean=57%) and L1 Spanish adults (mean=92%) is statistically significant ($t(20.255)=-2.655$, $p<0.05$), (ii) the difference in the results between bilingual children in the Spanish experiment (mean=42%) and

L1 Spanish adults (mean=92%) is also statistically significant (t(17.278)=-3.291, p<0.05), but (iii) the difference in the results between Spanish monolingual children (mean=57%) and bilingual children in the Spanish experiment (mean=42%) is not statistically significant (t(25)=0.855, p>0.05).




Graph 48: Rejection of *algunos* 'some' in 5/5 – Spanish experiment

In Graph 49 the percentages of rejection to the quantifier *batzuk* can be observed in the 5/5 context (underinformative use) of the Basque experiment by L1 Basque children, by bilingual children and by L1 Basque adults, respectively. Inferential tests reveal that: (i) the difference in the results between L1 Basque children (mean=43%) and L1 Basque adults (mean=90%) is statistically significant (t(35)=-4.745, p<0.05), (ii) the difference in the results between bilingual children in the Basque experiment (media=28%) and L1 Basque adults (media=90%) is also statistically significant (t(20.180)=-4.740, p<0.05), but (iii) the difference in the results between L1 Basque children (mean=43%) and bilingual children in the Basque experiment (mean=28%) is not statistically significant (t(31)=-1.201, p>0.05), as it happened with the Spanish experiment (Graph 51).




Graph 49: Rejection of *batzuk* 'some' in 5/5 – Basque experiment

## 7.3 DISCUSSION

This study analyzes the semantic and pragmatic comprehension of the weak quantifiers *algunos* and *batzuk* in Spanish and Basque, respectively. The interest focus resides in analyzing the derivation of SIs with these quantifiers, taking into account the difficulty that children show at an early age to detect violations of informativity that require the generation of this type of inferences.

A total of 74 participants carried out Version 1 of the SET (Chapter 3, section 3.3). Three groups of 5-to-6-year-old children took part in this study: a Basque-dominant Basque-Spanish bilingual group (n=13) was tested in its two languages, a Spanish monolingual group was tested in Spanish (n=14) and an L1 Basque group was tested in Basque (n=20). Moreover, two control groups formed by (i) adult Spanish native speakers (n=10) and (ii) adult Basque native speakers (n=17) were also tested.

The main aim of the present study was to answer the following research questions (RQ):

RQ1. 2L1 vs. 1L1: Do early bilingual children derive more SIs tan monolingual children?

RQ2. Early bilingual children: $L_a$ vs. $L_\alpha$: Do early bilingual children differentiate in their two languages?

Moreover, the following predictions were formulated: if differences were found between monolingual and bilingual children, and between the two languages of bilinguals, this would indicate that (for the simple analyzed in this study) the type of linguistic profile and the dominance in a language have an impact on the derivation of SIs with the quantifiers studied (Prediction 1). If, on the contrary, no differences were found between monolingual and bilingual children, nor between the two languages of bilinguals, this would indicate the presence of a (pragmatic deficit) pattern, regardless of a possible convergence between monolinguals and bilinguals and between the two languages of bilinguals (Prediction 2).

The results showed a lack of significant differences (i) between monolingual and bilingual children and (ii) between the two languages of bilingual children. The similarities between the two child groups (in line with Antoniou et al. 2013; Syrett et al. 2017) seem to obey to the (pragmatic deficit) developmental pattern attested crosslinguistically (Noveck 2004; Katsos et al. 2016), rather than to the (presence or absence of) bilingual convergence in the acquisition of quantifiers.

These results lead to the conclusion that for the sample tested in the present study, neither the linguistic profile (monolinguals vs. bilinguals), nor the dominance in a language (Basque-dominant bilinguals) has an effect on the derivation of SIs with weak quantifiers. Therefore, there is no solid evidende that suggests a bilingual (nor a monolingual) advantage in the derivation of SIs, nor the need of a greater dominance and exposure to the language at 5-6 years of age.

We know that, in order to obtain robust conclusions, the sample of the participants of this study should be extended. Besides, it is worth pointing out that the comparison between the child groups in the Basque experiment is not the same as the one in the Spanish experiment, since we do not have data from a Basque monolingual child group, due to their non-existence (see section 3.3). We need to highlight as well that the obtained results are valid for experimental comprehension contexts and that evidence from other type of situations is also needed.

In any case, the results of the present study seem to indicate that early bilingual children share a conceptual system (cf. Costa 2005; Kroll & Stewart 1994) for their two languages, which enables them to generate scales via concepts (in this case, concepts that represent different quantities) rather than via lexical items. The presence of shared concepts, instead of their lexical representation in each language, would explain why neither the linguistic profile nor a greater dominance and exposure to the language have an impact on the derivation of SIs with weak quantifiers at 5-6 years of age.

## 7.4 GENERAL CONCLUSION

The similarities between the two child groups (in line with Antoniou et al. 2013; Syrett et al. 2017) seem to obey to the (pragmatic deficit) developmental pattern attested crosslinguistically (Noveck 2004; Katsos et al. 2016), rather than to the (presence or absence of) bilingual convergence in the acquisition of quantifiers.

The gathered data reflect the complexity of the sociolinguistic situation in the Basque Country and the results obtained contribute to the theory of bilingual acquisition beyond the specific Basque–Spanish case.

# CHAPTER 8: GENERAL DISCUSSION

The present dissertation has provided new insights into children's acquisition and development of quantification in Spanish and Basque. Moreover, adults' interpretation of quantifiers has also been studied. On the one hand, the derivation of Scalar Implicatures (SI) has been analyzed (as regards the semantic and pragmatic properties of quantifiers) with the equivalents in Basque and Spanish of the quantifiers *all*, *most*, and *some* (from the positive scale) and *none*, *not all* and *some not* (from the negative scale). On the other hand, the interaction between universal quantifiers and negation has been studied. For that purpose, (i) two experimental tasks, a Sentence Evaluation Task (with two versions) and a Picture Selection Task have been conducted, in which (ii) 4-to-9-year-old children and adults have taken part. The literature on quantification (acquisition and comprehension studies, theories on quantification and works on quantification and negation) has been taken as a guideline in order to interpret the outcome of our experiments. The present dissertation makes important contributions:

First, it analyses the comprehension, acquisition and development of the most frequent positive and negated quantifiers in L1 Basque and L1 Spanish 4-to-9-year-old children and adults. More specifically, the exact Age of Acquisition (AoA) of each quantifier has been portrayed in both languages, as regards the semantic and the pragmatic meanings of quantifiers.

Second, two typologically distinct but in permanent-contact languages ─ Basque and Spanish ─ have been studied. Research in the Basque Country of Spain is of high interest, as it represents a sociolinguistically diverse region. This is the reason why a study on bilingualism has also been conducted, as a way to contrast the acquisition of SIs between Basque/Spanish monolingual children and Basque-dominant Basque-Spanish bilingual children, and between the two languages of bilinguals.

Third, the effect of the syntactic order between the negative operator and the universal quantifier on the interpretation of the sentence has been studied in both languages. Indeed, the contrast between UnivQ-Neg and Neg-UnivQ has been tested.

Fourth, two different techniques (SET and PST) have been employed for the experiment on the contrast between UnivQ-Neg and Neg-UnivQ, in order to focus on the difference between acceptance and preference of readings. It is worth highlighting that the same instrument and method has been used with children and adults for this experiment in both Basque and Spanish.

Fifth, adults' interpretations of sentences containing a universal quantifier and a negative operator are new to field of language comprehension, so they contribute to the theory of syntax beyond the specific Basque and Spanish case.

In this chapter, the theoretical significance of these findings will be acknowledged and new questions will be formulated for further research.

## 8.1 OVERVIEW OF THE STUDY

The main concern of the present dissertation was to test the hypotheses and answer the research questions presented in section 3.1, repeated here for the reader's convenience:

**HYPOTHESES**

**HYP1.** Children show a gradual acquisition of the semantic properties of quantifiers (totality, partiality, proportionality, monotonicity) (Katsos et al. 2012, 2016).

**HYP2.** Children acquire the semantic properties of quantifiers before the pragmatic ones (Noveck 2001, 2004; Katsos et al. 2012, 2016).

**HYP3.** The "Observation of Isomorphism" accounts for children's interpretation of sentences containing a universal quantifier and a negative operator (Musolino 1998; Musolino et al. 2000).

**HYP4.** There is no bilingual advantage as regards the derivation of SIs (Siegal et al. 2007; Antoniou et al. 2013; Syrett et al. 2017).

**RESEARCH QUESTIONS**

**RQ1.** How and when do Basque and Spanish children acquire the semantic properties of positive and negated quantifiers (Katsos et al. 2012, 2016)?

**RQ2.** Which factors influence on the acquisition of the pragmatic properties of quantifiers? Do we observe 'a pragmatic deficit stage' (Noveck 2001) or is there a lack of knowledge about the scalar items in question ('Scalar Approach'; Barner et al. 2011)?

**RQ3.** Does the "Observation of Isomorphism" (Musolino 1998; Musolino et al. 2000) account for Basque and Spanish children's interpretation of sentences containing a universal quantifier and a negative operator?

**RQ4.** Is there a bilingual advantage as regards the derivation of SIs (Siegal et al. 2007; Antoniou et al. 2013; Syrett et al. 2017)?

Taking into account these hypotheses and research questions, and based on previous literature on the acquisition of quantification, we formulated 6 predictions (see section 3.4).

Predictions 1 to 4 are related to the semantic and pragmatic properties of quantifiers, Prediction 5 is related to the interaction between universal quantifiers and negation and Prediction 6 is related to methodological effects.

- **PREDICTION 1:** SEMANTICALLY MORE COMPLEX QS WILL BE ACQUIRED LATER:
  - **PREDICTION 1A:** PARTIAL QS WILL BE ACQUIRED LATER THAN TOTAL QS.
  - **PREDICTION 1B:** PROPORTIONAL QS WILL BE ACQUIRED LATER THAN PARTIAL QS.
  - **PREDICTION 1C:** MONOTONE DECREASING QS WILL BE ACQUIRED LATER THAN MONOTONE INCREASING ONES.

- **PREDICTION 2:** CHILDREN WILL HAVE MORE DIFFICULTIES DETECTING VIOLATIONS OF INFORMATIVITY THAN VIOLATIONS OF TRUTH-CONDITIONS.

- **PREDICTION 3:** CHILDREN WILL DERIVE FEWER SIS THAN ADULTS.

- **PREDICTION 4:** THE LINGUISTIC PROFILE OF THE CHILDREN WILL NOT AFFECT THE DERIVATION OF SIS.

- **PREDICTION 5:** THE ORDER BETWEEN UNIVQS & NEG WILL DETERMINE THE RESULTING INTERPRETATION.

- **PREDICTION 6:** THE KIND OF TASK WILL HAVE AN EFFECT ON THE UNIVQ-NEG / NEG-UNIVQ INTERPRETATION.

In order to test these predictions, two experiments were conducted, EXPERIMENT 1 and EXPERIMENT 2, and EXPERIMENT 1 was carried out in two different versions, Version 1 and Version 2. Both EXPERIMENT 1 and EXPERIMENT 2 were experimental off-line tasks and they measured oral comprehension data.

EXPERIMENT 1 is the adaptation to Spanish and to Basque of the linguistic items in the materials from Katsos et al. (2012) and it is a Sentence Evaluation Task (SET). In Version 1 of EXPERIMENT 1 the comprehension of the following quantifiers was tested: *todos*, *ninguno*, *algunos*, *la mayoría*, *no todos* and *algunos no* in Spanish, and *guztiak*, *bat ere ez*, *batzuk*, *gehienak*, *guztiak ez* and *batzuk ez* in Basque. In Version 2 of EXPERIMENT 1 a slight modification of the materials was made and the inverse order of the negated universal quantifiers was tested: *todos no* for Spanish and *ez guztiak* for Basque.

EXPERIMENT 2 was a Picture Selection Task (PST). In this experiment the interaction between the universal quantifier *guztiak* for Basque and *todos* for Spanish and the negative operator was investigated, including Neg-UnivQ in EXPERIMENT 1 and a modified version (UnivQ-Neg) in EXPERIMENT 2.

A total of 384 native speakers of Basque and Spanish (children and adults) participated in the experiments carried out for the present dissertation, divided into different groups across tasks:

- **FLA study**: 310 participants were recruited for Versions 1 and 2 of EXPERIMENT 1 and EXPERIMENT 2, where data from participants' L1 were collected. For the FLA study, see Chapters 4, 5 and 6.

- **Bilingual study**: 74 participants were recruited for the study on bilingualism, where data from the participants' two L1s were collected. For the Bilingual study, see Chapter 7.

In Table 19 (repeated from Table 2) the total number of participants in the FLA study is described (divided by experiment, version, language of the experiment, linguistic profile, age and place of residence). In Version 1 of the SET data from different child-age groups as well as adult controls were collected.

| Experiment | Version | Language of the Experiment | Linguistic Profile of Participants | Age | Place | Number of Participants |
|---|---|---|---|---|---|---|
| **Sentence Evaluation Task (SET)** | V1 | Spanish | L1Spanish | 4-5 | Gasteiz/Iruña | 38 |
| | | | | 6-7 | Gasteiz/Iruña | 23 |
| | | | | Adults | Gasteiz/Lizarra | 12 |
| | | Basque | L1Basque | 4-5 | Ordizia/Ibarra | 21 |
| | | | | 6-7 | Ordizia/Ibarra | 37 |
| | | | | 8-9 | Ordizia | 17 |
| | | | | Adults | Gasteiz/Orereta | 10 |
| | V2 | Spanish | L1Spanish | 5-6 | Iruña | 14 |
| | | | | Adults | Gasteiz/Lizarra | 12 |
| | | Basque | L1Basque | 5-6 | Ordizia | 25 |
| | | | | Adults | Gasteiz/Orereta | 10 |
| **Picture Selection Task (PST)** | ---------- | Spanish | L1Spanish | 5-6 | Iruña | 25 |
| | | | | Adults | Gasteiz/Lizarra | 17 |
| | | Basque | L1Basque | 5-6 | Ordizia/Ibarra | 27 |
| | | | | Adults | Gasteiz/Orereta | 22 |
| | | | **TOTAL Nº OF PARTICIPANTS:** | | | **310** |

Table 19: Summary of Participants in the FLA study

Previous literature (see Noveck 2001, 2004; Guasti et al. 2005; a.o.) found that 5 is the age at which the semantic meaning is already acquired, but there are other areas of knowledge, such as pragmatics (i.e. utterance meaning) which are not still mastered. For this reason, in Version 1 of the SET a pseudo-longitudinal study was conducted for which data from 4-to-7/9-year-old children were analysed, in order to see the age at which children start behaving adult-like,

which means making use of pragmatic resources in relation to quantification and the derivation of SIs. In Version 2 of the SET and in the PST transversal studies were carried out and data from 5-6-year-old children (and adults) were collected, as previous work has shown that 5-year-olds differ systematically from adults in the way they interpret sentences containing a universal quantifier and negation (Musolino, 1998; Musolino et al. 2000).

For the experiments carried out in Spanish, monolingual speakers of Spanish (children and adults) were recruited in Gasteiz (Araba), Iruña and Lizarra (Navarre). For the experiments carried out in Basque, Basque-dominant Basque-Spanish bilingual speakers (children and adults) were recruited in Gasteiz (Araba), Ordizia, Ibarra and Orereta (Gipuzkoa) (see section 3.3 for details about the participants and the sociolinguistic context).

Most of the studies on the derivation of SIs (Noveck 2001, 2004; Guasti et al. 2005; Katsos et al. 2016; a.o.) have focused on monolingual children, but few of them have investigated this phenomenon with bilingual children (Siegal et al. 2007; Antoniou et al. 2013; Syrett et al. 2017).

The Basque Country offers the possibility to conduct this type of research with bilingual children, since it represents a language contact situation with two typologically distant languages: Basque and Spanish. For this reason, a Bilingual study was conducted in which three groups of 5-to-6-year-old children participated in Version 1 of the SET: a Basque dominant Basque-Spanish bilingual group (n=13) was tested in its two languages, as well as a Spanish monolingual group (n=14) and a L1 Basque group (n=20), in order to (1) know their knowledge about the semantic-pragmatic meaning of the quantifiers *batzuk* and *algunos* ‘some’ and to (2) compare (i) bilinguals’ interpretations with those of monolinguals and (ii) bilinguals’ interpretations in their two languages. Their results were also compared to a group of Spanish native controls (n=10) and a group of Basque native controls (n=17).

In what follows a discussion for the results obtained is given, in light of the predictions (section 8.2) and the hypotheses and the research questions (section 8.3) presented in Chapter 3.

## 8.2 DISCUSSION: PREDICTIONS

### 8.2.1 Prediction 1A: Partial Qs will be acquired later than total Qs

This prediction is part of a more general prediction which claims that semantically more complex quantifiers will be acquired later. One of the main semantic properties of quantifiers (see Chapter 2) is the totality vs. partiality distinction and, more specifically, the quantity or the set that quantifiers denote. Previous studies (Hanlon 1988; Katsos et al. 2016; a.o.) found out that quantifiers that refer to the totality of the potential reference set (like *all*) are earlier acquired than quantifiers whose reference set is a portion of the potential reference set (like *some*), due to the inexact quantity denoted by the latter, thus its greater complexity as compared to the former. In this way, we expected L1Spanish and L1Basque children to better comprehend the quantifiers *todos* for Spanish and *guztiak* for Basque than the quantifiers *algunos* for Spanish, and *batzuk* for Basque.

Version 1 of EXPERIMENT 1 confirms Prediction 1, as both L1Spanish and L1Basque children give adult-like answers with the quantifiers *todos/guztiak* since they are 4 years old, as compared to the quantifiers *algunos/batzuk*, whose meaning is acquired in a gradual way from 4- to 7/9-years of age. It should be noticed that while *algunos/batzuk* were tested for truth-conditions and informativeness (i.e. semantic and pragmatic meanings), *todos/guztiak* were only tested for their semantic meaning, since they cannot be tested in an under-informative condition, that is, there is not a logically stronger, more informative quantifier than *todos/guztiak* in order for them to be under-informative or pragmatically infelicitous. This finding goes in concordance with previous

literature on the acquisition of quantifiers (Hanlon 1988; Katsos et al. 2016; a.o.) and points out that the totality vs. partiality distinction is a crosslinguistic fact rather than a language-specific issue.

### 8.2.3 Prediction 1B: Proportional Qs will be acquired later than partial Qs

We expected 4-to-6-year-old children to have fewer difficulties comprehending the partial quantifiers *algunos* for Spanish and *batzuk* for Basque, than comprehending the proportional quantifiers *la mayoría* for Spanish and *gehienak* for Basque (see Hackl 2009; Pietroski et al. 2009; Katsos et al. 2012), since the latter are semantically more complex than the former. In fact, while both *algunos*/*batzuk* and *la mayoría*/*gehienak* refer to an underspecified subset of the potential set, *la mayoría* and *gehienak* pose an additional semantic difficulty, as they refer to a quantity which is 'more than half' (see Pietroski et al. 2009). Indeed, the meaning of *most* is obtained based on the relation between the cardinalities of two sets, rather than in terms of a relation between the individual elements of those sets (i.e. one-to-one readings). In other words, while children need to pay attention to just one set in order to derive the meaning of *some*, they are expected to observe and compare two sets so as to obtain the meaning of *most*, what poses an additional difficulty.

Prediction 2 has also been confirmed, as both L1Spanish and L1Basque 4-to-7/9-year-old children had difficulties to comprehend the quantifiers *la mayoría* and *gehienak*, fact that goes in line with the results obtained by Barberán (2011, 2012) for Spanish and Basque and by Katsos et al. (2016) in a study of 31 languages.

The interesting finding and indeed one of the contributions of the present dissertation is that the difficulty observed with the quantifiers *la mayoría* and *gehienak* was found at age 7 with Spanish children and at age 8-9 with Basque children. The scarcity of SIs derived by children with *la mayoría* and *gehienak* is

definitely not due to a pragmatic deficit, since the same Spanish and Basque children are able to derive SIs with the partial quantifiers *algunos* and *batzuk* at age 7 and 8-9, respectively. Different factors make the comprehension of this quantifier more difficult:

(i) LOW FREQUENCY. The frequency that the quantifiers have in everyday use also has an effect on their comprehension. In the Spanish corpus CREA (Corpus de Referencia del Español Actual)[25], which is a written and an oral corpus with more than 160 millions of forms (see RAE 2005; Pitkowski & Vásquez 2009), it can be observed that the word *mayoría* has the position 332 in a list of the 1000 most frequent words, in comparison to *algunos* which has the position 147, or *todos* 'all' which has the position 60. In the Basque corpus ETC (Egungo Testuen Corpusa)[26], which is a 21st century written corpus with 269,2 millions of forms (see Sarasola et al. 2016), it can be observed that the word *guzti(ak)* had a 19.90% of frequency in 2015, in comparison to *batzuk* which had a 20.41% of frequency, or *gehien(ak)* which had a 7.22% of frequency. Looking at those percentages/position numbers, a possible reasoning is that the order of acquisition of quantifiers could be related to their frequency (thus the quantity of input).

(ii) SEMANTIC COMPLEXITY. The inexact quantity denoted by *most* clearly imposes a difficulty on its comprehension and acquisition.While both *some* and *most* refer to a sub-set of the total potential set, *most* refers to a portion which is 'more than a half' (Pietroski et al. 2009). Thus, out from 5 apples, what does *most* refer to? 3 apples? 4 apples? In EXPERIMENT 1 *most* was coded to refer to 4 out of 5 apples, however 3 out of 5 apples would not be either an incorrect interpretation of *most*, as it is still 'more than a half'. Moreover, depending on the potential set (i.e. the total number of items in a set), the quantity denoted by quantifiers also changes; for instance, *most* can

[25] Corpus de Referencia del Español Actual [http://corpus.rae.es/creanet.html]
[26] Egungo Testuen Corpusa [http://www.ehu.eus/etc/]

be interpreted as 4 out of 5, but as 900 out of 1000. Thus, the quantity denoted by the potential set determines the interpretation of the quantifier under study. It is also important to highlight the fact that quantifiers can be related to numerals in order to get an interpretation (as previously explained), but not necessarily: *most* can be interpreted as 4 out of 5, but also as 'nearly all', a non-numeral-based interpretation.[27] An important point to mention is that the Warm-up Exercise of EXPERIMENT 1 (see section 3.2.1.1.2) was conducted with numerals and not with quantifiers; it facilitated the comprehension of the task and it has been observed that (i) more SIs are generated with scales formed by numerals than with those formed by quantifiers, due to the exhaustive (precise) reading of numerals (see Huang et al. 2013). However, when conducting the experiment we observed that this led the participants (at least initially) to assign the quantifiers a numeral-based interpretation and, therefore, the need to know the exact number of items denoted by each quantifier, what hardened the comprehension of *most*.

(iii) MORPHOSYNTATIC CHARACTERISTICS. The distinct morphosyntactic characteristics that *la mayoría* and *gehienak* have make their comprehension and acquisition more challenging. Etxeberria (2005) suggests that *gehienak* is a superlative, due to its similar behavior to genuine superlatives.[28] This author holds this claim based on the following pieces of evidence: (i) *gehienak* 'most' can appear with an uninflected noun as in (46)-(47), (ii) it can appear with the partitive case *–rik* as in (48)-(49), and (iii) it can appear with the partitive construction (ablative plural) *–etatik* as in (50)-(51) (examples taken from Etxeberria 2005).

[27] See Everett (2005) to read about a language – Pirahã – with no grammatical numbers and just a couple of quantifiers ('a few', 'many', 'much'). In this language quantifiers can only obtain non-numeral-based interpretations.

[28] See Hackl (2009) for a similar claim as regards 'most'. He proposes that 'most' is the superlative form of 'many'.

(46) Ikasle altuena Jon da.
student tall-sup.-D John be.pres
"The tallest student is John".

(47) Liburutegi honek ditu liburu gehienak.
library this.erg has book most-D.pl
"This library has most (of the) books".

(48) Ikasle-rik altuena Jon da.
student-part. tall-sup.-D John be.pres
"The tallest student is John".

(49) Liburutegi honek ditu liburu-rik gehienak.
library this.erg has book-part. most-D.pl
"This library has most (of the) books".

(50) Ikasle-etatik altuena Jon da.
student-D.pl-of. tall-sup.-D John be.pres
"The tallest student is John".

(51) Liburutegi honek ditu liburu-etatik gehienak.
library this.erg has book-D.pl-of most-D.pl
"This library has most (of the) books".

In the case of the Spanish quantifier *la mayoría*, Sánchez (1999) proposes that it is a nominalized quantifier (see Sánchez 1999), due to the obligatory presence of a determiner plus a partitive construction, as it can be observed in the following examples (52)-(54):

(52) **La** mayoría **de las** manzanas están en las cajas.
**D.sg** most **of** D.pl apples be.pres in D.pl box.pl
"Most of the apples are in the boxes".

(53) ***La** mayoría **las** manzanas están en las cajas.
**D.sg** most D.pl apples be.pres in D.pl box.pl
"*Most of apples are in the boxes".

(54) *Mayoría **de las** manzanas están en las cajas.
Most **of** D.pl apples be.pres in D.pl box.pl
"Most of the apples are in the boxes".

Therefore, on top of the previously discussed semantic complexity of *gehienak* and *la mayoría* (as compared to *batzuk/algunos*) and the low frequency rates, their morphosyntactic properties cannot be obviated.

Our claim is that their morphosyntactic properties together with their semantic complexity and their low frequency explain children's inaccuracy rates with these quantifiers in the present study and, more specifically, their difficulty to find and reject alternatives in an appropriate scale (Horn 1972). In line with Barner et al. (2011), if a child does not comprehend an item like (55) (due to its semantic and morphosyntactic complexity), it will be impossible for her to locate alternatives (56), reject them (57) and derive the corresponding SI (58).

(55) MOST of the apples are in the boxes.
(56) {a few, some, MOST, all…}
(57) {~~a few~~, ~~some~~, MOST, ~~all~~…}
(58) MOST, but not all, the apples are in the boxes.

As Barner et al. (2011) proposed, several steps have to be followed for the derivation of a SI: (i) IDENTIFICATION (of the members of a scale), (ii) ORDERING

(of those members) and (iii) REJECTION (of alternatives). The results obtained with the quantifier *most* in Basque and Spanish in Version 1 of EXPERIMENT 1 reveal that 7-9-year-old children IDENTIFY *most* as an element that quantifies a set of things, but they are not sure about the exact quantity it denotes, thus they cannot ORDER it with respect to *some* (if it is stronger or weaker) and, therefore, they do not know which is the stronger alternative to REJECT. In line with Barner et al. (2011), we conclude that it is the lack of knowledge about the appropriate entailment relationships between the items which blocks children from generating a SI.

In sum, (i) the inexact quantity denoted by *gehienak* and *la mayoría* (their semantic complexity), (ii) their low frequency in input (as compared to *batzuk/algunos*) and (iii) their distinct morphosyntactic nature imposes a marked difficulty on the acquisition of their semantic and pragmatic meanings for both L1 Spanish and L1 Basque children.

### 8.2.4 Prediction 1C: Monotone decreasing Qs will be acquired later than monotone increasing ones

In line with previous literature (Just & Carpenter 1971; Katsos et al. 2016;), we expected children's rates of comprehension to be higher with monotone increasing quantifiers like *all*, *most* and *some* than with monotone decreasing ones like *none*, *not all/all not* and *some not*,[29] since the latter are composed of two logical operators (the quantifier plus the negative operator) and the direction of entailment is reversed with respect to monotone increasing ones (see section 2.1.1.3).

Prediction 3 has been confirmed, since both Spanish and Basque children obtain higher rates of target responses with monotone increasing quantifiers

[29] Monotone decreasing quantifiers should not be confused with negated quantifiers, even if in Spanish, Basque and English they happen to coincide in many cases (see section 2.1.1.3).

(*todos* 'all' and *algunos* for Spanish, and *guztiak* and *batzuk* for Basque) than with monotone decreasing ones (*no todos* and *algunos no* for Spanish, and *guztiak ez* and *batzuk ez* for Basque).

Children have to face a double difficulty when being exposed to sentences with a quantifier plus a negative operator: (i) the scope relationship between the quantifier and the negative operator, and (ii) the derivation of a SI. This difficulty to derive SIs with negated quantifiers has been reflected in the lack of knowledge about the pragmatic meaning that both language groups have shown, that is, their difficulty to reject under-informative or pragmatically infelicitous sentences with negated quantifiers. This finding goes in line with previous literature on the acquisition and comprehension of negated quantifiers in a study of 31 languages (see Katsos et al. 2016).

The difficulty to reject under-informative sentences with negated quantifiers has been observed to be enhanced with the quantifier 'not all' and this is due to the distinct location of the negative operator with respect to the quantifier between Spanish and Basque in Version 1 of EXPERIMENT 1.[30] The original task was in English and we adapted the materials to Basque and Spanish. Basing on the premise of analyzing the equivalent (and most natural) quantifiers in each language, *not all* (Neg-UnivQ) was translated as *no todos* (Neg-UnivQ) in Spanish and as *guztiak ez* (UnivQ-Neg) in Basque (with no element intervening in between, as in 'not all').

Our results suggest that the difference in the order of the constituents has had an impact on the readings of the sentences in each language (i.e. the syntactic reading determining the semantic one). While in the Spanish translation (*no todos*) the negative operator precedes the quantifier (Neg-UnivQ), in the Basque

[30] This finding will be treated in more depth in section 8.2.8, where isomorphism and the interaction between universal quantifiers and negation in Basque and Spanish are discussed in detail.

translation (*guztiak ez*) it is the quantifier that precedes the negative operator (UnivQ-Neg). Thus, while the order in Spanish (Neg-UnivQ) favors a reading where the negative operator takes scope over the quantifier (*some*-reading), the order in Basque (UnivQ-Neg) favors a reading in which the quantifier takes scope over the negative operator (*none*-reading).

The difference in the order of the constituents has had a strong impact not only on children's readings but also on adults' interpretations. According to Lidz & Musolino (2002), while 5-year-old children have difficulties to access non-isomorphic readings, adults are supposed to have full access to non-isomorphic readings and covert movements. However, our data have shown that adults (mostly L1Spanish adults) stick to surface scope (isomorphic) readings in a higher degree than expected.

### 8.2.5 Prediction 2: Children have more difficulties detecting violations of informativity than violations of truth-conditions

Based on previous studies on early language acquisition (see Noveck 2001, 2004; Guasti et al. 2005; Papafragou & Musolino 2003; a.o.), in which children had been found to be more sensitive to violations of truth than to violations of pragmatic felicity or informativity, we expected children to have fewer difficulties detecting true/false-and-informative sentences than detecting true-but-under-informative ones.

Prediction 4 has been (partially) confirmed. Our results have shown that Basque and Spanish children access the semantic meaning of quantifiers since they are 4-year-old (except for *la mayoría* and *gehienak*), thus, they are able to discriminate if the truth-conditions are satisfied or not by the context in question. The pragmatic meaning of quantifiers is acquired gradually from 4- to-7/9-years of age, in line with previous studies on the early acquisition of quantification (see

Noveck 2001, 2004; Katsos et al. 2012; Guasti et al. 2005; Papafragou & Musolino 2003).

However, Spanish and Basque children differ as regards the quantifier *algunos / batzuk*. Indeed, while Spanish children are able to derive a SI and reject under-informative sentences with *algunos* (thus, knowing its pragmatic meaning) by the age of 7, Basque children do not seem to fully grasp the pragmatic meaning of *batzuk* till the age of 8-9. In line with this finding, Basque and Spanish children differ as regards the negated quantifiers *algunos no* / *batzuk ez*. More specifically, while Spanish children know the pragmatic meaning of *algunos no* by the age of 6-7, Basque children do not acquire it till the age of 8-9.

This is an important finding, since the main question behind these results is if this delay in the acquisition of the pragmatic meaning of *batzuk* (in its positive and negative counterparts) that Basque children show can also be observed with other quantifiers or if it is only restricted to *batzuk* 'some'. In this case, frequency does not play a role, since *batzuk* is even more frequent than *guzti(ak)* (see Sarasola et al. 2016)[31], so other factors must be intervening on this process.

It is important to highlight the fact that the Basque experiment was also conducted with an additional group of 69 Spanish-dominant Basque-Spanish bilingual 4-to-9-year-old children from Gasteiz (Araba), Iruña (Nafarroa) and Bilbo (Bizkaia) (not included in the present dissertation; see Barberán, in prep.). The interesting fact about the results is that they did not grasp the pragmatic meaning of *batzuk* neither of *batzuk ez* till the age of 8-9, as happens with the Basque-dominant Basque-Spanish bilingual children tested in EXPERIMENT 1 of the present dissertation. Data suggest that the distinct linguistic profiles of the

[31] These frequencies have been obtained from a corpus which covers data from the whole Basque Country. Maybe these frequencies could vary if they were calculated directly from the region where the Basque experiment was conducted (in this case, Gipuzkoa).

children (Basque-dominant vs. Spanish-dominant) and the input received in the target language (i.e. Basque) do not make a difference in the acquisition of the pragmatic meaning of *batzuk*. Therefore, the delay in the acquisition of the pragmatic meaning that Basque children show seems to be related to the quantifier *batzuk* itself, rather than to the linguistic profile of the children or to a general difficulty in the acquisition of the pragmatic meaning of quantifiers (the influence of the linguistic profile of the children on the derivation of SIs with this quantifier will be treated in more depth when Prediction 4 is discussed).

One way of testing if the delay in the acquisition of the pragmatic meaning that Basque children show would be looking at the mean rates of other positive quantifiers tested as well for their pragmatic meaning, in this case *gehienak*. However, as it have been previously observed (see the discussion for Prediction 1B), *gehienak* is in itself complex, since children have not still acquired its semantic meaning at the of 7 in Spanish and 8-9 in Basque.

A plausible explanation for the delay in the acquisition of the pragmatic meaning that Basque children show with the quantifier *batzuk* can be found looking at its behaviour, in comparison to that of *algunos* (in line with the analysis made with *la mayoría* and *gehienak*). In Spanish, *algunos* 'some' does not presuppose a definite set of items (59a,b), whereas *unos* 'some' can refer to a definite set of items (60).

(59) a. Han venido ALGUNOS chicos, pero no muchos.
have come som boys but not many
'Some boys have come, but not many.'

b. Han venido ALGUNOS chicos: #Jon, Peru y Mikel.
have come some boys Jon Peru and Mikel
'Some boys have come. Jon, Peru and Mikel.'

(60) Han venido UNOS chicos: Jon, Peru y Mikel.
have come some boys Jon Peru and Mikel
'Some boys have come. Jon, Peru and Mikel.'

Vargas-Tokuda et al. (2009) conducted an experiment which tested the interpretation of both *unos* and *algunos* 'some' by 5-year-old Spanish monolingual children. They discovered that children derived more SIs with *algunos* than with *unos*. In fact, while children could interpret *algunos* as meaning "some, but not all" or as "some, in fact all", *unos* was mainly understood as "some, and possibly all", not leading to the derivation of a SI.

In Basque, *batzuk* can behave both like *algunos* and *unos*, that is, not presupposing a definite set of items as in (61) or referring to a definite set of items (62).

(61) Mutil BATZUK etorri dira, baina ez asko.
boys some come are but not many
'Some boys have come, but not many'

(62) Mutil BATZUK etorri dira: Jon Peru eta Mikel.
boys some come are Jon Peru and Mikel
'Some boys have come. Jon, Peru and Mikel.'

This dual role (*unos* and *algunos*) that *batzuk* can fulfil is a clear indicative of its more complex properties, in contrast to *algunos*. Thus, the higher complexity is key to explain the later development observed in the pragmatic enrichment of *batzuk* with Basque children. In fact, our data seem to indicate that Basque children start comprehending *bat-zuk* (="one+plural") as *un-os* (="one+plural") (Etxeberria 2005, 2012), thus they do not have the necessity to derive a SI with this quantifier at an early age, and it is not till age 8-9 that they begin to understand *batzuk* as *algunos* and, thus, derive the corresponding SIs.

This finding is reinforced looking at the details of the study carried out by Katsos et al. (2016). In this study the comprehension of *all*, *none*, *some*, *most* and *some not* by 5-to-6-year-old children was analyzed in 31 languages. As regards the derivation of SIs and, more specifically, the rejection of *some* in under-informative contexts, completely distinct patterns were observed among languages. Cantonese (13.3%), Malay (13.5%) and Korean (15.3%) were the languages with the lowest rate of rejections to the under-informative 'some'. In contrast, Catalan (80%), French (80%), English (80.4%) and Russian (91%) were the languages with the highest rate of rejections to the under-informative *some*. Interestingly, Catalan and French share the property of being Romance languages, however, the other two Romance languages studied – Spanish and Italian – did not get such high scores (55.6% and 62.3%, respectively).

If the items tested in each language are analyzed, the following differences can be observed: in Spanish *algunos* 'some' and in Italian *alcune* 'some' were tested, whereas in Catalan *unes quantes* 'a few' (instead of *algunes* 'some') and in French *quelques* 'some' (instead of *certains* 'some/certain') were studied. The distinct items analyzed in each of the languages can explain the differences found in the rejection rates of the under-informative 'some'. In fact, if we focus on the case of French, the distinction between *quelques* and *certains* is parallel to the one between *algunos* and *unos* in Spanish, as *quelques* and *algunos* do not presuppose a definite set of items, whereas *certains* and *unos* can. Noveck (2001) found that 7/8-year-old children and 10/11-year-old children accepted under-informative sentences with *certains* in 89% and 95% of cases, respectively (see section 2.1.4.2.2.1), in contrast to the high rejection rates with *quelques* (80%) found with 5/6-year-old children by Katsos et al. (2016). The fact that in Basque there is a competition in the two uses of *batzuk* (as it can function both as a quantifier and as an indefinite determiner) explains the later acquisition of the pragmatic meaning (and thus, the derivation of SIs) of *batzuk* by Basque children (around 8-9 years of age) with respect to the earlier acquisition of *algunos* by Spanish children (at 7 years of age).

Another important aspect to take into account is the partitive/non-partitive readings that the quantifier *some* can take (see section 2.1.1.2). In Version 1 of EXPERIMENT 1 of the present dissertation, *some* was translated as *algunos* in Spanish and as *batzuk* is Basque, with no partitive markers in both languages. The original item in English (i.e. the one tested by Katsos et al. 2016) contained the partitive marker *of* (as in *Some of the apples are in the boxes*). As previously pointed out, Katsos et al. (2016) found that English was one of the languages with the highest rate of rejections to the under-informative *some* (80.4%). Therefore, it can be observed that the explicit presence of the partitive marker positively affects children's rejection of underinformative utterances with *some*, as children can focus on the divisibility of the reference set. This facilitating factor (i.e. the partitive marker) was not present in the Basque neither in the Spanish tested items, so lower rejection rates are comprehensible.

Regarding the theoretical framework described in Chapter 2, our results are consistent with the *semantics-to-pragmatics developmental pattern* proposed by Noveck (2001, 2004) for children. It has been observed that the evolution of the semantic meaning of positive quantifiers differs from the one of the pragmatic meaning with both L1 Spanish and L1 Basque children. In fact, the semantic meaning of positive quantifiers (except for 'most') is already acquired at the age of 4/5, whereas the pragmatic meaning of positive quantifiers is acquired gradually exactly from 6 years of age onwards.

Our results have also indicated that both L1 Spanish and Basque children have difficulties in detecting not only the violations of informativeness (i.e. rejecting under-informative sentences and thus deriving SIs) with the quantifier *most*, but also in detecting the violations of truth with this quantifier. It could be the case that, as Barner et al. (2011) state in their Scalar Approach to quantifiers, children's failure to derive SIs with this quantifier is not due to a pragmatic deficit, but to a lack of knowledge about its semantic meaning and the

quantificational scale it belongs to. However, the analysis of *batzuk* has suggested that not only the semantic and pragmatic properties have to be taken into account when studying children's comprehension of quantifiers, but also their set-denoting properties. The importance of the specific properties of linguistic items for the acquisition and evolution of languages cannot be underestimated and, in fact, they are steadily employed as determining criteria to classify languages by complexity (see Dahl 2004; Sampson et al. 2005; Givón & Shibatani 2009).

Therefore, the proposal and contribution of the present study is to bring together both the Developmental and the Scalar Approaches and to add a third component, which is the specific set denoted by quantifiers. In other words, (i) the semantic meaning of quantifiers is consolidated earlier (at age 4/5) than the pragmatic meaning (from 6 years onwards); (ii) for the pragmatic meaning to be accessed, the semantic meaning has to be already acquired; (iii) for generating a SI (and thus accessing the pragmatic meaning), the knowledge of the scale in question, the possible alternatives and the correct distribution of the items are needed (see section 2.1.4.2.2.2); and (iv) the set-denoting properties of the quantifier in question will completely determine the derivation of SIs.

Therefore, if the distinct complexity of the linguistic items is key to explain the acquisition of the semantic meaning of quantifiers and, thus, the development of pragmatic enrichment and the derivation of SIs, cross-linguistic variation is predicted in the acquisition and comprehension of logical operators from language to language: the more complex (semantic, morphosyntactic and set-denoting) properties an element has, the later its acquisition and, thus, the higher the difficulty to enrich its meaning by means of pragmatics.

### 8.2.6 Prediction 3: Children will derive fewer SIs than adults

Previous literature has accounted that adults show no difficulties in detecting violations of truth-conditions and informativeness (see Guasti et al. 2005; Noveck 2001; Papafragou & Musolino 2003), thus, we predicted that Spanish and Basque adults would have no difficulties in detecting neither of the two types of violations in the tasks developed. Moreover, based on the fact that children have difficulties to detect violations of informativeness (Noveck 2001, 2004; a.o.), contrary to adults, we expected to find differences between the comprehension pattern of Spanish/Basque adults and the one by Spanish/Basque children and, more specifically, we predicted that children would derive fewer SIs than adults.

Prediction 3 has been confirmed, as Spanish/Basque children derive fewer SIs than Spanish/Basque adults with both positive and negated quantifiers. Indeed, children start rejecting under-informative sentences and deriving SIs in a consistent way from 6 years of age onwards, in line with previous literature on early language acquisition (see Guasti et al. 2005; Noveck 2001, 2004; Papafragou & Musolino 2003; a.o.)

Though EXPERIMENT 1 was not specifically designed for testing adults' interpretations (adults participated as the control-group), it is worth considering their results in light of the theoretical framework analyzed in Chapter 2. It has been observed that the L1 Spanish and Basque adults tested in the present study almost always (in more than 90% of cases) derive SIs (i.e. reject under-informative sentences) with the quantifiers tested for their PM, i.e. *algunos* and *la mayoría* for Spanish, and *batzuk* and *gehienak* for Basque. These results suggest that adults follow the "Cooperative Principle" and the "maxim of quantity" proposed by Grice (1975, 1989) and derive SIs every time the context requires it, as Relevance Theory claims (see Sperber & Wilson 1995[1986]) (see section 2.1.3.3).

An important question that needs to be tackled is whether children adjust to the "Cooperative Principle" (Grice, 1975, 1989). This principle explains the cooperative behaviour that adults show in conversational situations, but it makes no prediction for children. When collecting the data for EXPERIMENT 1, children were cooperative with the experimenters (as young as 4-year-olds); however, some form of *yes*-bias was observed. As Ambridge & Rowland (2013) explain, "children may be reluctant to contradict an adult (particularly an unfamiliar experimenter) by answering *no*" (p. 12). So what we need to (re)define is the notion of "being cooperative" for children. While adults cooperate with their interlocutors by being as informative as possible (following the "maxim of quantity" in a strict sense), 4-to-6-year-old children cooperate in a different way: (i) they try to understand the task, (ii) they adjust to the experimenter's needs, (iii) they try to be relevant ("maxim of relevance") and (iv) they give brief and direct answers ("maxim of manner").

In sum, the way we understand being cooperative may be defined differently depending on the age of the participants. This fact goes in line with the study carried out by Röhrig (2015) (see section 2.1.4.2.2.2), where she found that children payed attention to different maxims of Grice's (1975, 1989) Cooperative Principle at different stages.

### 8.2.7 Prediction 4: The linguistic profile of the children will not affect the derivation of SIs

The few studies carried out on the derivation of SIs with bilingual children as compared to monolingual children have given evidence for different results. Siegal et al. (2017) found enhanced pragmatic abilities on behalf of bilingual children, whereas other studies (Antoniou et al. 2013; Syrett et al. 2017) have attested no bilingual advantage.

Based on the similar pattern observed between Basque-dominant and Spanish-dominant bilinguals discussed in Prediction 3, we expected to find no differences in the performance of children with distinct linguistic profiles. A Basque dominant Basque-Spanish bilingual group (n=13) was tested in its two languages, as well as a Spanish monolingual group (n=14) and a L1 Basque group (n=20), in order to (1) know their knowledge about the semantic-pragmatic meaning of the quantifiers *batzuk* and *algunos* and to (2) compare (i) bilinguals' interpretations with those of monolinguals and (ii) bilinguals' interpretations in their two languages.

Results showed similarities (i) between monolinguals and bilinguals and (ii) between the two languages of bilinguals. The similarities found between the child groups (Antoniou et al. 2013; Syrett et al. 2017) seem to obey to the strong developmental pattern attested crosslinguistically (Noveck 2004; Katsos et al. 2016), rather than to the (presence or absence of) bilingual convergence in the acquisition of quantifiers. In fact, there is no solid evidende that indicates a bilingual (nor a monolingual) advantage in the derivation of SIs, nor the need of a greater dominance and exposure to the language at 5-6 years of age.

This is an interesting finding, since it poses new questions as regards the importance of input and the AoA of a certain language: for the sample tested in this study, it can be concluded that it is the knowledge of the quantifier itself what determines the ability to derive SIs (in line with our previous findings; see discussion for Predictions 2 and 3). In any case, a bigger population and children from other age-groups should also be tested, in order to assess our results.

### 8.2.8 Prediction 5: The order between UnivQs & Neg will determine the resulting interpretation

According to the "Observation of Isomorphism" (Musolino 1998; Musolino et al. 2000), as seen in section 2.2.2.1, "children's semantic scope

coincides with overt syntactic scope", thus we predicted L1Spanish & Basque children to interpret Neg-UnivQ as Neg having scope over UnivQ and to interpret UnivQ-Neg as UnivQ having scope over Neg (i.e. isomorphic readings). In order to test this prediction, Version 2 of EXPERIMENT 1 was conducted with 5-year-old children (adapted from Version 1).[32]

Based on the description of Spanish and Basque negated quantifiers (section 6.2) and on the "Observation of Isomorphism", which predicts that the syntactic scope determines the semantic one (Musolino 1998; Musolino et al. 2000), these were the specific predictions under Prediction 5:

Both L1 Spanish and L1 Basque children will derive isomorphic readings, so:

***PREDICTION 5.1*:** Neg-UnivQ = Neg>UnivQ = *some*-reading (Basque and Spanish)

***PREDICTION 5.2*:** UnivQ-Neg = UnivQ>Neg = *none*-reading (Basque and Spanish)[33]

Results showed that both 5-year-old Spanish and Basque children almost always accepted the '0/5 context' (i.e. the *none*-reading) when interpreting *todos no/guztiak ez* 'all not' (UnivQ-Neg). That is, they relied on the information provided by the surface structure order between the QP and the negative operator. Thus, in the UnivQ-Neg condition, both Spanish and Basque children were behaving isomorphically, fact that supports Prediction 5.2.

Interestingly, when the reversed order (Neg-UnivQ) was tested (i.e. when interpreting *no todos/ez guztiak* 'not all'), two different patterns were observed in

[32] For the sake of clarity, a joint discussion will be given for the results obtained in both versions (Version 1 and Version 2) of EXPERIMENT 1. This applies for sections 8.2.8 and 8.2.9 (i.e. Predictions 5 and 6).

[33] As explained in Chapter 6, when the symbol "-" is used, linear order is expressed; when ">" is used, structutal order/scope is meant (in this case, the first element having scope over the second one).

both languages: children who rejected in a higher rate the '0/5 context' (i.e. accepting a *some*-reading, thus behaving isomorphically) and children who accepted in a higher rate the '0/5 context' (i.e. accepting a *none*-reading, thus behaving non-isomorphically).[34] So Prediction 5.1 is partially confirmed.

The above results support the "Observation of Isomorphism" (Musolino 1998; Musolino et al. 2000) in the UnivQ-Neg condition, but not in the Neg-UnivQ condition, as not all the children derive 'isomorphic readings' in this condition. Moreover, individual differences have been found to be important when analyzing children's responses, since two distinct patterns were observed in both languages: children behaving isomorphically in a constant way (not at chance) and children behaving non-isomorphically.

While there are no significant differences between Spanish and Basque children in neither of the two conditions, the interesting fact about the results is that there are differences between Spanish and Basque adults, significant in the '0/5 context'. For the Neg-UnivQ order, both adult groups clearly prefer the *some*-reading, which indeed reflects an isomorphic reading. For the UnivQ-Neg order, Spanish adults clearly prefer a *none*-reading (isomorphic reading); in contrast, two different patterns can be found among Basque adults: those who accept the *some*-reading (non-isomorphic interpretation) and those who accept the *none*-reading (isomorphic interpretation).

[34] This finding could be related to the study by Thornton et al. (2016) with cleft sentences, but they approach a perspective based on reconstruction processes (in line with Reeve 2011, 2012) and the copy theory of movement advocated by Chomsky (1993), where the scope between the operators is reversed. In example (I) (taken from Thornton et al. (2016; p. 392) we can observe that the possessive pronoun *his* can be bound by *no politician*, even though the latter does not c-command the pronoun in the surface syntax. Thornton et al. (2016) explain that "on the reconstruction theory, there are two copies of the NP *his collaborators* in the derivation; the higher copy is pronounced in the surface syntax (Ia), but it is the lower copy that is interpreted at LF, as shown in (Ib)" (p. 392).

(I) a. It is **his$_{1/2}$ collaborators** that no politician$_1$ ignores ~~his$_{1/2}$ collaborators~~.
b. It is his$_{1/2}$ collaborators that no politician$_1$ ignores **his$_{1/2}$ collaborators**.

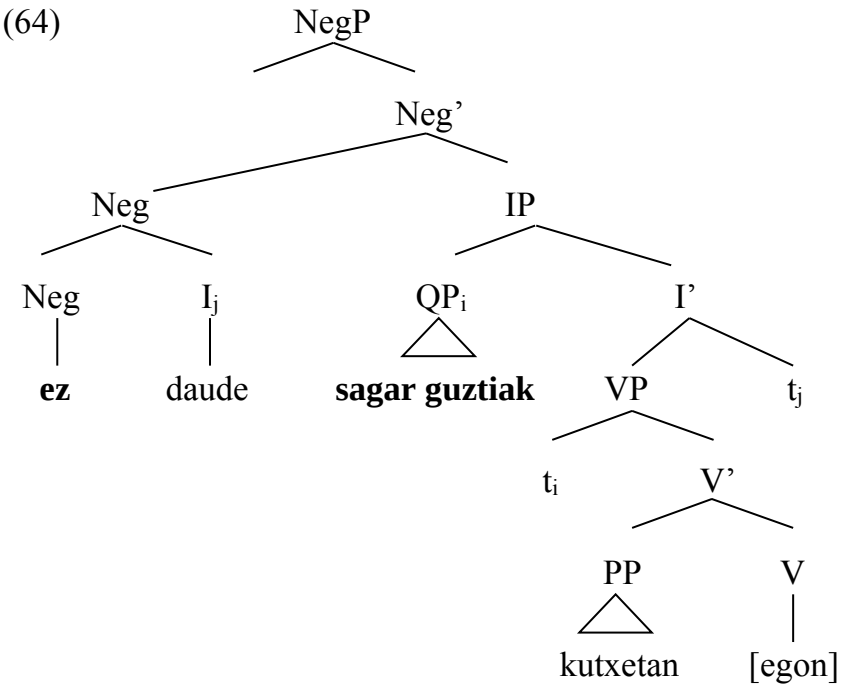
Lidz and Musolino (2002) observe that while children usually have difficulties accessing 'non-isomorphic readings', adults are able to access covert movements, thus 'non-isomorphic readings'. The fact that adults' answers vary when the order of the elements is reversed can be due to the fact that different interpretations are accessible for them, and that the order UnivQ-Neg (as opposed to Neg-UnivQ) makes the *none*-reading more accessible not only for children, but also for adults. Specifically, while the order UnivQ-Neg has an unambiguous *none*-interpretation for Spanish adults, this seems not to be the case for Basque adults.

It has been claimed (Laka 1988, 1990) that in Basque the NegP occupies a higher position than the Inflectional Phrase (IP) and that the Inflection (Infl/I) adjoins to Neg in finite sentences, in order to satisfy the condition that "Neg must be c-commanded by Infl at S-structure" (Pollock 1989; Laka 1990).

Based on the previous facts, we propose that a sentence like (63) has the tree-structure representation in (64):

(63) **Ez** daude **sagar guztiak** kutxetan
not are apples all-the boxes-the-in
"Not all the apples are in the boxes"

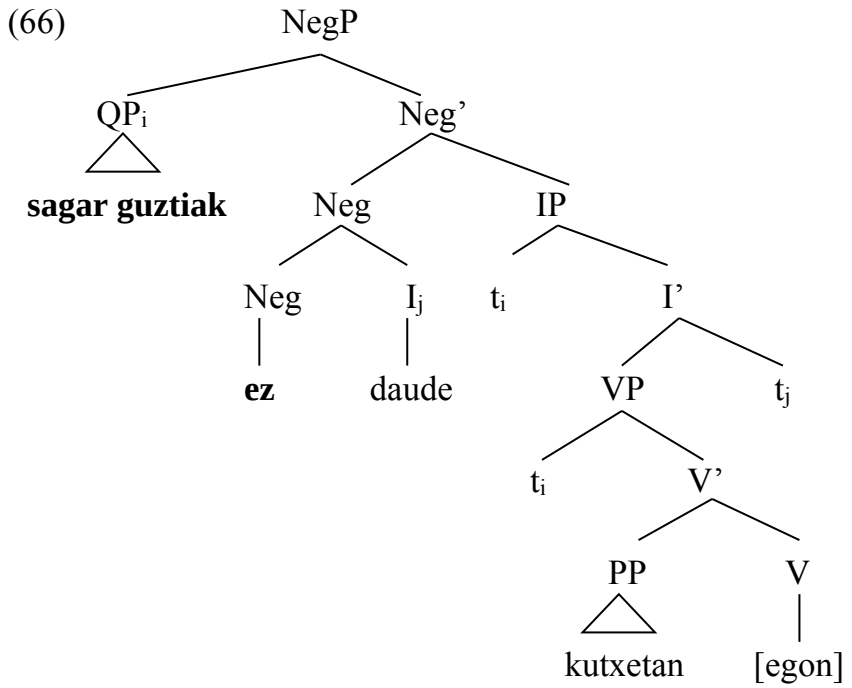
(64)




In the tree-structure representation in (64), we can observe that Neg c-commands (see section 2.2.2.1.2 for the definition of 'c-command') the QP *sagar guztiak*, thus Neg takes scope over the QP. The QP *sagar guztiak* can optionally move from Spec/IP to Spec/NegP (Laka 1988, 1990), resulting in a sentence like the one in (65) and in the transformed structure in (66):

(65) **Sagar guztiak ez** daude kutxetan
apples all-the not are boxes-the-in
"All the apples are not in the boxes"

In the structure represented in (66), the QP *sagar guztiak* c-commands the negative operator *ez*, therefore the QP takes scope over Neg.




It has been suggested (Etxeberria 2012) that no matter whether the negative operator appears linearly before or after the universal quantifier, negation always takes scope over the QP in adults' interpretations in Basque. This claim clearly explains the results obtained in our study and predicts that the older the children, the higher the tendency to derive a *some-reading* will be (Neg>UnivQ).

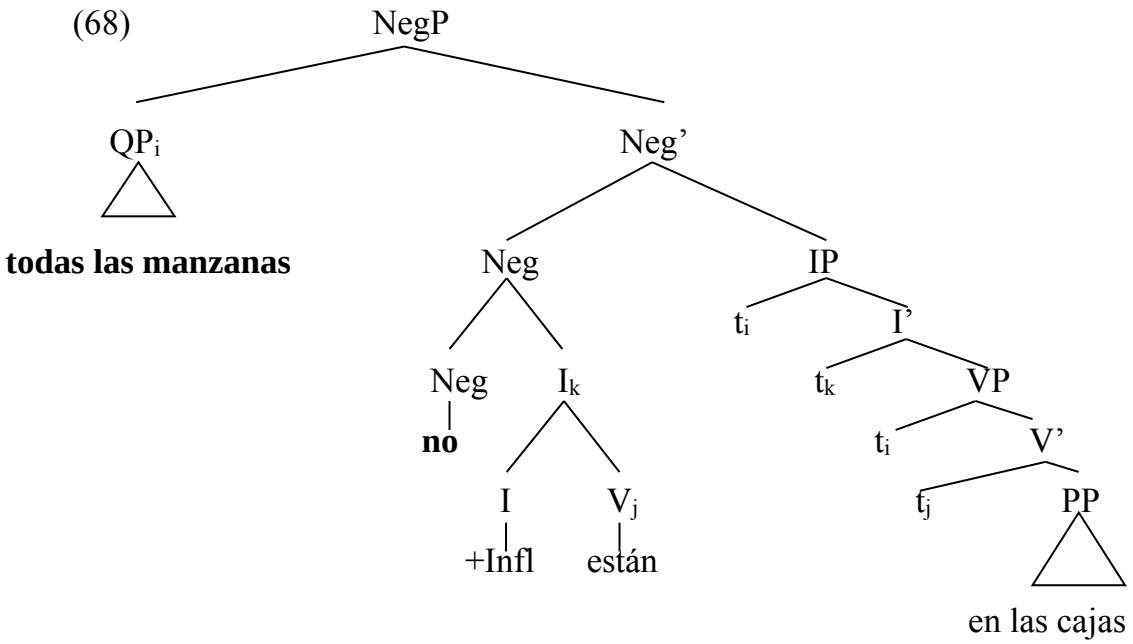
This finding indicates that children are not deriving their interpretations based on the linear word order, but they do rely on the c-command relation between the negative operator and the universal quantifier (see Lidz and Musolino 2002).

In Spanish it has been claimed that the NegP occupies an external position to the IP and that Infl does adjoin to Neg in order to c-command it (Pollock 1989; Laka 1990). In addition, it is assumed that the verb (V) moves to I in Spanish.

Thus, in line with these facts, we propose that a sentence like (67) has the tree-structure representation in (68):

(67) **Todas las manzanas no** están en las cajas
all the apples not are in the boxes
"All the apples are not in the boxes"

(68)

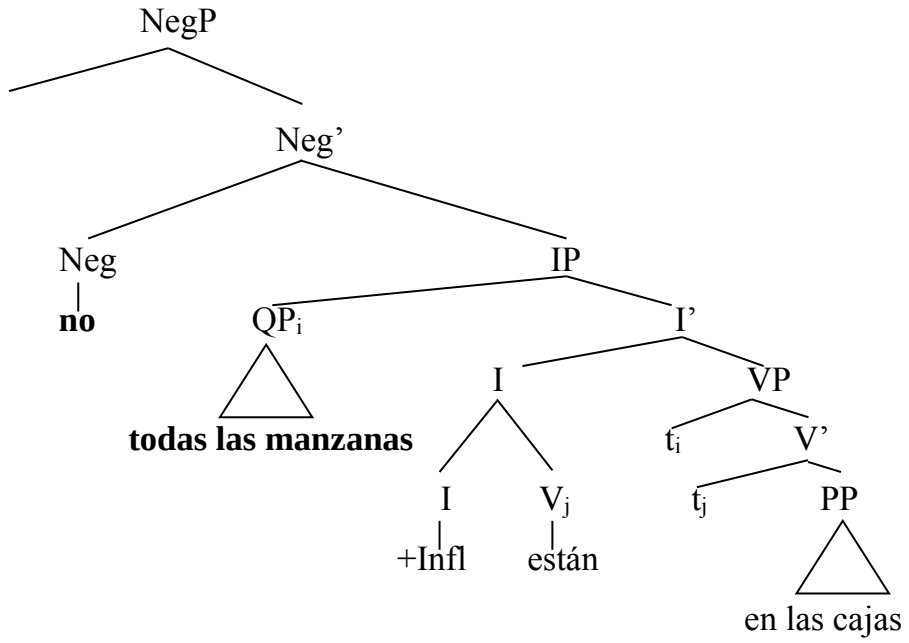



In the tree-structure represented in (68), it is the QP *todas las manzanas* which c-commands Neg, therefore the QP takes scope over Neg.

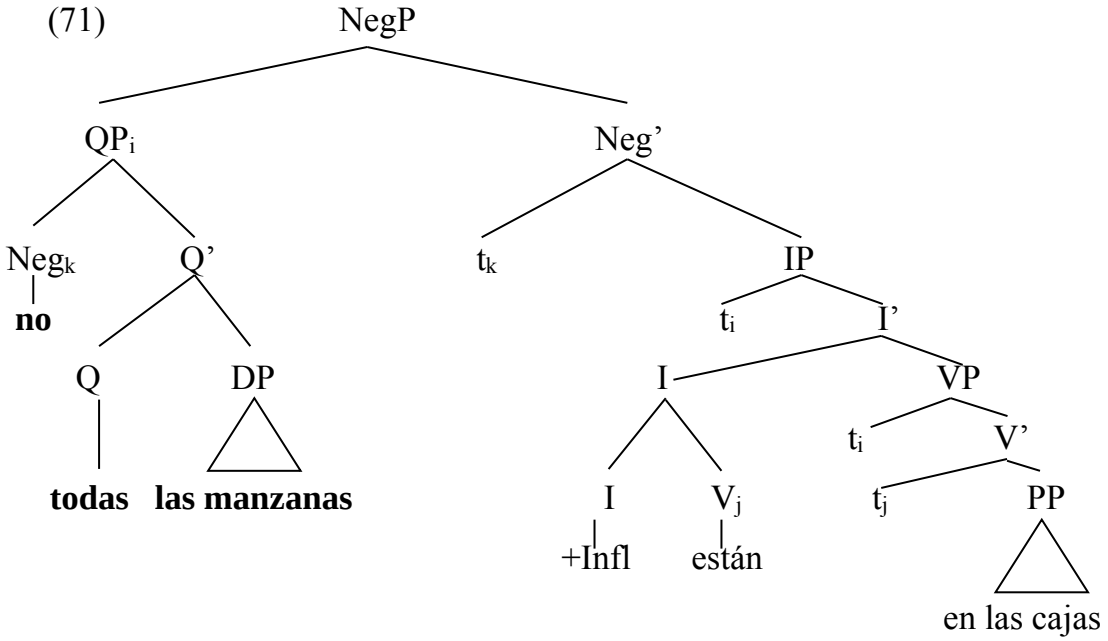
On the contrary, a sentence like (69) can be represented as (70) or as (71):

(69) **No todas las manzanas** están en las cajas
not all the apples are in the boxes
"Not all the apples are in the boxes"

(70)




(71)




We propose that in neither (70) nor (71) the I adjoins to Neg, contrary to what happened in structures like (68). (70) is different from (71) in these respects: in (70) Neg can take wide scope over the whole sentence and lead to a *none*-reading (i.e. sentential negation), whereas in (71) *no todas las manzanas* behaves as a constituent, in which Neg has narrow scope over *todas las manzanas*, leading to a *some*-reading.

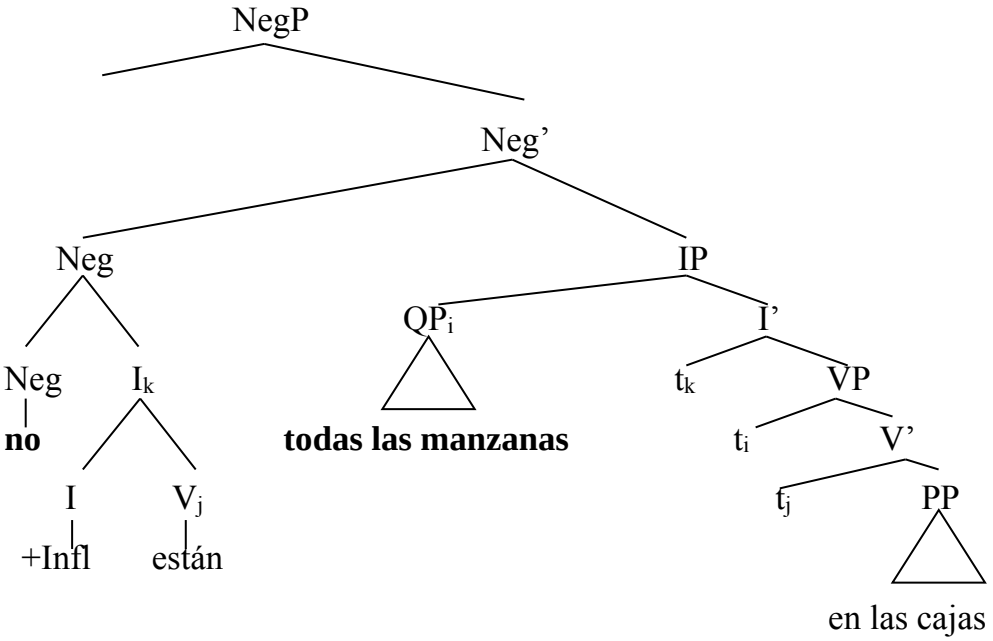
Our results indicate that our participants are interpreting (69) as represented in (71), due to their high rate of *some*-readings with this structural order. Thus, they are interpreting *no todas las manzanas* as a constituent, parallel to the English equivalent *not all the apples*.

It has to be highlighted that a sentence like (72) was not tested in the present study.[35]

(72) **No** están **todas las manzanas** en las cajas
not are all the apples in the boxes
"Not all the apples are in the boxes"

The sentence in (72) would be the nearest equivalent to the Basque counterpart in (63) (i.e. *Ez daude sagar guztiak kutxetan*), and its structure would be the one in (73):

(73)




[35] Our aim was to adapt the English material to Spanish and Basque being as faithful as possible to the original items and deriving the most natural sentences in the target languages. In any case, a study on the contrast between (69) and (72) would be of high interest.

In (73), contrary to (70) and (71) and similar to (68), I adjoins to Neg and Neg c-commands the QP *todas las manzanas*. Though further research is needed, we predict that a structure like (73) will be interpreted as that in (70), this is, Neg taking wide scope over the whole sentence and leading to a *none*-reading (i.e. sentential negation).

In sum, the results obtained in Versions 1 and 2 of EXPERIMENT 1 (as regards the interaction between universal quantifiers and negation) reveal that: (i) 5-year-old Spanish & Basque children are sensitive to the different scope relations between UnivQ-Neg / Neg-UnivQ; (ii) children's interpretations do not differ for Spanish and Basque; (iii) adults' interpretations differ for Spanish and Basque; (iv) children and adults differ in the interpretation of UnivQ-Neg/Neg-UnivQ sentences in Spanish and Basque.

Besides, individual differences have been found to be essential when analyzing children's responses, since two distinct patterns were observed in both Spanish and Basque: children who consistently derive isomorphic readings and children who consistently behave non-isomorphically. If we only concentrate on the overall mean rates, we can miss important information about the preferences and the development of children's interpretations. Therefore, individual differences have to be considered in acquisition studies.

We conclude this section by making two important contributions: first, the "Observation of Isomorphism" has to be reformulated (at least for Spanish and Basque), as children's results in the Neg-UnivQ condition do not conform to it. Second, half of the 5-year-old L1 Spanish and L1 Basque children do not rely on linear isomorphic readings, but they rely on the c-command relationship between the universal quantifier and the negative operator. Therefore, our study goes in concordance with the "structural isomorphism" approach (see Lidz and Musolino 2002), rather than with the "linear isomorphism" one.

### 8.2.9 Prediction 6: The kind of task will have an effect on the UnivQ-Neg / Neg-UnivQ interpretation

It should be taken into account that EXPERIMENT 1 (SET) was not directly designed for testing the interaction (and the possible interpretations) between universal quantifiers and negation, but to test the interpretation of other quantifiers as well (the ones presented in Version 1 of the SET), fact that could be a latent or covert variable to be taken into account in future research (see Featherston 2005; Schmitt & Miller 2010; Crain & Thornton 1998; McDaniel et al. 1996; Blom & Unsworth 2010). As Schmitt & Miller (2010) argue, "in comprehension experiments, much like other experiments, the behavior may be influenced by the task itself, the experimental materials (…)" (p. 35). In any case, EXPERIMENT 1, being a Sentence Evaluation Task, enabled us to know the possible readings that participants accepted.

EXPERIMENT 2, a Picture Selection Task (PST), was designed exclusively to test the interaction between universal quantifiers and negation. In the PST participants could express their preference for one picture (i.e. reading) over the other; thus, we could obtain a comparison between *acceptance* (EXPERIMENT 1 – SET) and *preference* (EXPERIMENT 2 – PST) of reading(s). As the experiments measure different notions, we expected outcome differences between the PST and the SET. In fact, while the PST forces the participants to choose just one reading for a specific utterance (being more restrictive), the SET allows for a possible scenario where the participants can accept two different readings for the same utterance.

Prediction 6 was confirmed, based on the following results (those that are different from the ones in the SET):

In the UnivQ-Neg condition in the PST, L1Basque adults choose the non-isomorphic *some* reading for *guztiak ez* 'all not' in the majority of cases (70%),

as opposed to the 53% of *some*-readings obtained in the SET. As explained in section 8.2.8, this finding supports Etxeberria's (2012) claim that no matter whether the negative operator appears linearly before or after the universal quantifier, negation always takes wide scope in adults' interpretations.

In the Neg-UnivQ condition in the PST, the majority of the L1Basque children (21 out of 27; a 74% of the children) chose the non-isomorphic *none* reading for *ez guztiak* 'not all', while in the SET two distinct patterns were observed. Moreover, Basque adults' preference for the *some*-reading in this Neg-UnivQ condition was reinforced in the PST. This finding indicates that although a sentence can be interpreted in two possible ways, the condition of having to choose one of them reveals the actual preference of the participants.

Thus, it is clear that the outcome of the PST is different from the one in the SET, so a task-effect can be observed in this study. The same finding that the SET and the PST have shown is that some of the children's results (specifically, those obtained in the Neg-UnivQ condition) do not conform to the Observation of Isomorphism, since both 5-year-old Spanish and Basque children can access the non-isomorphic reading *none* with Neg-UnivQ.

The differences observed between L1Spanish and L1Basque children when interpreting the Neg-UnivQ order may be due to the fact that the sentences tested in both languages are the nearest equivalents (and the most natural utterances in each language), but they are structurally different: in Spanish, there is no element intervening between the negative operator and the universal quantifier (see (74a)) whereas in Basque, the verb and the noun are intervening between the negative operator and the universal quantifier (see (75b)).

(74) a. NO TODAS las manzanas están en las cajas.
not all the apples are in the boxes
'Not all the apples are in the boxes'

b. EZ daude sagar GUZTIAK kutxetan.
not are apples all-the boxes-the-in
'Not all the apples are in the boxes'.

Sentences like (74b) were tested in the SET and the PST, because a sentence like (75) (where no element intervenes between the negative operator and the universal quantifier) is ungrammatical in Basque:

(75) *EZ GUZTIAK daude sagar kutxetan.
Not all-the are apples boxes-the-in
'Not all the apples are in the boxes'.

This structural distance between Spanish and Basque most probably had an effect on the different results obtained with L1Spanish and L1Basque children: while L1Spanish children could have interpreted *no todos* 'not all' as Neg having scope just over UnivQ (favouring a *some*-reading), L1Basque children could have interpreted *ez guztiak* 'not all' as a sentential negation, that is, Neg having scope over the whole sentence (favouring a *none*-reading). In sum, the structural differences have led to differences in scope, what at the same time has had an influence on the readings of the sentences in each language (i.e. the syntactic reading determining the semantic one; see Lidz and Musolino 2002).[36]

In sum, it has been observed that the results obtained in the SET have not been fully replicated in the PST. Thus, the differences observed in the results from one experiment to the other may be due to the experimental task itself, what implies a methodological effect.

[36] Though intonation was not controlled in the present study, Etxeberria & Irurtzun (2004, in prep.) claim that when different intonation patterns are used, scope ambiguities seem to be more plausible (not only in Basque, but also crosslinguistically).

Ambridge and Rowland (2013) argue that "most truth-value judgment tasks can be converted into an equivalent binary pointing task (…). The disadvantage here is that this method reveals only participants' preferred interpretation, not whether or not they would accept the other. We believe that both type of tasks (the SET and the PST) are useful tools in order to assess participants' interpretations in comprehension studies (see Featherston 2005; Schmitt & Miller 2010; Crain & Thornton 1998; McDaniel et al. 1996; Blom & Unsworth 2010), but, as other type of tasks, they have positive and negative points:

In the SET (EXPERIMENT 1), the participants were expected to accept or reject each utterance with respect to a specific context. However, if the participants did not understand the informativeness expectation (i.e. the expectation that an item could be under-informative in a given context), then they may accept a 'good enough' description of a context (Blom & Unsworth 2010). In the PST, the participants were not asked to accept or reject utterances in specific contexts, but they had to choose the picture (one out of two) which best suited each utterance. The SET, therefore, gave information about the readings accepted by participants for certain utterances, but the PST revealed the preferred reading by participants for those utterances (acceptance vs. preference).

Moreover, the SET was designed to test the interpretation of six different quantifiers as regards the derivation of SIs, as opposed to the PST, which was specifically designed for testing the interaction (and the possible interpretations) between universal quantifiers and negation. Thus, in line with Schmitt & Miller (2010), the behavior (i.e. the results) observed in the SET may have been influenced by the experiment itself, leading to more acceptance rates rather than strict preference. Therefore, the main findings from the SET and the PST reveal that the methodology employed is key when the interpretations derived from the

interaction between universal quantifiers and negation are studied (see Moscati & Gualmini 2008, for similar results with modals and negation).

Although a SET is useful and necessary to understand a participant's accepted readings, we believe that the preferred reading will be the one a speaker will actually produce in a non-experimental context. Therefore, contrary to Ambridge and Rowland (2013), we do not consider the fact of having to choose the preferred reading in a PST a disadvantage, but a clear indicative of how participants would react in real discourse.

## 8.3 DISCUSSION: HYPOTHESES AND RESEARCH QUESTIONS

### 8.3.1 HYP 1-2 & RQ1-2

**HYPOTHESES**

**HYP1.** Children show a gradual acquisition of the semantic properties of quantifiers (totality, partiality, proportionality, monotonicity) (Katsos et al. 2012, 2016).

**HYP2.** Children acquire the semantic properties of quantifiers before the pragmatic ones (Noveck 2001, 2004; Katsos et al. 2012, 2016).

**RESEARCH QUESTIONS**

**RQ1.** How and when do Basque and Spanish children acquire the semantic properties of positive and negated quantifiers (Katsos et al. 2012, 2016)?

**RQ2.** Which factors influence on the acquisition of the pragmatic properties of quantifiers? Do we observe 'a pragmatic deficit stage' (Noveck 2001) or is there a lack of knowledge about the scalar items in question ('Scalar Approach'; Barner et al. 2011)?

The results of the present dissertation have shown that Basque and Spanish children acquire quantifiers in the same way as children from other languages (see Noveck 2001, 2004; Guasti et al. 2005; a.o.). While previous studies (Katsos et al. 2012, 2016) have only focused on 5-6-year-old children, we have conducted a pseudo-longitudinal research and collected data from 4-to-9-year-old children, in order to obtain the exact AoA as well as a complete picture of the developmental pattern followed by Basque and Spanish children in the acquisition of quantification.

We have observed that the feature that shapes this acquisition pattern is complexity, as quantifiers that are semantically and morphosyntactically more complex are acquired later. So the question is: what makes a quantifier more complex than others? Our results have demonstrated that there are several characteristics which contribute to that complexity: totality, partiality, proportionality, monotonicity and scope. In fact, we have found that:

(i) total quantifiers are earlier acquired than partial ones;
(ii) partial quantifiers earlier than proportional ones;
(iii) monotone increasing quantifiers earlier than (monotone) decreasing ones;
(iv) quantifiers that interact with a negative operator (in terms of scope) pose an additional challenge as compared to their positive counterparts.

In any case, the acquisition of a quantifier not only implies acquiring its semantic meaning, but also its pragmatic one, that is, the derived meaning in a discourse context. This pragmatic meaning is directly related to the concepts of scale and informativity and the derivation of SIs. Indeed, having the ability to derive a SI means being aware of a non-literal (semantic) meaning, i.e. a pragmatic one. So for the acquisition of the pragmatic meaning of a quantifier, several premises have to be known (in line with Barner et al., 2011): (i) the items

that belong to a scale; (ii) the order of those items in the scale as regards informativity; and (iii) a common understanding of the context of utterance between the speaker and the hearer.

The present dissertation has shown that first the semantic meaning of quantifiers is stablished and, afterwards, from 6 years of age onwards, the pragmatic meaning is acquired. The results have also shown that Spanish children start deriving SIs with the partial quantifier *algunos* at 7-years old, while Basque children do it with *batzuk* at 8-9-years old. This finding has been explained in terms of the complex properties of *batzuk*, leading to its delayed acquisition. Therefore, the proposal and contribution of the present study is to bring together both the Developmental (Noveck 2011) and the Scalar Approach (Barner et al. 2011) and to add a third component, which is the analysis of the specific properties of each quantifier.

We can, therefore, conclude that HYP1 and HYP2 are confirmed.

### 8.3.2 HYP3 & RQ3

**HYPOTHESIS**

**HYP3.** The "Observation of Isomorphism" accounts for children's interpretation of sentences containing a universal quantifier and a negative operator (Musolino 1998; Musolino et al. 2000).

**RESEARCH QUESTION**

**RQ3.** Does the "Observation of Isomorphism" (Musolino 1998; Musolino et al. 2000) account for Basque and Spanish children's interpretation of sentences containing a universal quantifier and a negative operator?

The present dissertation has demonstrated that the "Observation of Isomorphism" (Musolino 1998; Musolino et al. 2000) does not account for Basque and Spanish children's interpretation of universal quantifiers plus negation. In fact, we claim that the "Observation of Isomorphism" has to be reformulated (at least for Spanish and Basque). Results have shown that in the Neg-UnivQ condition, half of the 5-year-old Spanish and Basque children do not rely on the information provided by the surface structure (linear isomorphism), but on the c-command relationship between the universal quantifier and the negative operator (structural isomorphism). This is also an important finding, as it calls into question the traditional surface syntax-semantics mapping and, moreover, it predicts crosslinguistic differences, basing on the premise that languages differ as regards syntactic structure.

From the above results we can conclude that HYP3 is not confirmed.

We have been able to observe as well that the methodology has had an effect on the interpretation of universal quantifiers and negation. The Sentence Evaluation Task (SET) employed in EXPERIMENT 1 has given us the opportunity to know which the ACCEPTED readings (*none*- or *some*-readings) are by 5-to-6-year-old children and adults, while the Picture Selection Task (PST) designed for EXPERIMENT 2 has enabled us to identify the PREFERRED interpretations. The obtained readings by children and adults have changed from one task to the other, what implies a methodological effect. This is a crucial finding, since, thanks to the combination of both types of tasks, we have gathered different pieces of information (acceptance and preference) and, thus, we have obtained a more complete picture than the studies which conduct a unique type of task. In any case, a PST would be a more adequate type of task if participants' readings were to be measured in real discourse contexts, where just the preferred interpretation is actually produced.

### 8.3.3 HYP4 & RQ4

**HYPOTHESIS:**

HYP4. There is no bilingual advantage as regards the derivation of SIs (Siegal et al. 2007; Antoniou et al. 2013; Syrett et al. 2017).

**RESEARCH QUESTION:**

RQ4. Is there a bilingual advantage as regards the derivation of SIs (Siegal et al. 2007; Antoniou et al. 2013; Syrett et al. 2017)?

The Bilingual study has shown that the linguistic profile of the children (Basque vs. Spanish dominant) does not affect the derivation of SIs with the partial quantifiers *batzuk* and *algunos*. The similar pattern found (i) between monolinguals and bilinguals and (ii) between the two languages of bilinguals (in line with Antoniou et al. 2013 and Syrett et al. 2017) seems to obey to the strong developmental pattern attested crosslinguistically (Noveck 2004; Katsos et al. 2016), rather than to the (presence or absence of) bilingual convergence in the acquisition of quantifiers.

These results lead to the conclusion that for the sample tested in the present study, neither the linguistic profile (monolinguals vs. bilinguals), nor the dominance in a language (Basque-dominant bilinguals) has an effect on the derivation of SIs with weak quantifiers. Therefore, there is no solid evidende that suggests a bilingual (nor a monolingual) advantage in the derivation of SIs, nor the need of a greater dominance and exposure to the language at 5-to-6 years of age. This is an important finding as it supports our claim that it is the complexity of the quantifier itself what determines its acquisition and, therefore, the ability to derive SIs.

Finally, we can conclude that HYP4 is confirmed.

## 8.4 MAIN CONCLUSIONS AND CONTRIBUTIONS

The present dissertation has been carried out to test a set of hypotheses, research questions and predictions, by means of: (i) an FLA study and a Bilingual study, (ii) different experimental tasks (Versions 1 and 2 of EXPERIMENT 1 and EXPERIMENT 2), (iii) a total of 384 participants from different age-groups and linguistic profiles and (iv) the analysis of data from two typologically distant but in permanent contact languages: Basque and Spanish.

The main concern of this dissertation has been to explore the comprehension, acquisition and development of a selection of quantifiers in Basque and Spanish (already tested in other early language acquisition studies) by 4-to-9-year-old children. Besides, adults have been tested as well, as controls for EXPERIMENT 1 and as participants for EXPERIMENT 2.

Quantifiers are unique and special linguistic items that give the researchers the opportunity to study many different aspects, but we have focused on investigating (i) the derivation of SIs (in relation to the semantic and pragmatic properties of quantifiers) and (ii) the interaction of universal quantifiers and negation (based on a syntactic analysis). As a conclusion, the main findings of the present dissertation are the following:

**1)** 4-to-9-year-old Basque and Spanish children follow the same developmental pattern in the acquisition of quantifiers.

**2)** The complexity of the semantic, morphosyntactic and pragmatic properties of quantifiers influence on the derivation of SIs.

**3)** The linguistic profile of 5-to-6-year-old children does not influence on the derivation of SIs.

**4)** The interaction between quantifiers and negation influences on the derivation of SIs by 4-to-9-year-old children.

**5)** 5-to-6-year-old-children do not obtain linear isomorphic readings by default when interpreting sentences containing a universal quantifier plus a negative operator. This implies a reformulation of the "Observation of Isomorphism".

**6)** Spanish and Basque adults differ as regards the interpretation of sentences containing a universal quantifier and a negative operator.

**7)** The kind of task (Sentence Evaluation Task vs. Picture Selection Task) influences on the resulting interpretation between universal quantifiers and negation, not only with children but also with adults.

The main contributions of this dissertation relate to four distinct fields, all of them important for Applied Linguistics:

**a)** As regards psycholinguistics, this dissertation portrays a picture of the development of strong universal quantifiers, weak partial quantifiers and weak proportional quantifiers in two different languages – Basque and Spanish – in 4-to-9-year-old children.

**b)** With respect to methodological reliability, this work has employed the material already tested in more than 30 languages, what enables a trustworthy comparison between languages. Moreover, the high number of participants, taking into account the proportion of age and linguistic profile, and the use of two experimental tasks, a Sentence Evaluation Task and a Picture Selection Task, have strengthened and enriched the reliability of the methodology.

**c)** Regarding theoretical linguistics, this dissertation has examined the scope features of sentences containing a universal quantifier and a negative operator in Basque and Spanish 5-to-6-year-old children and adults. More specifically, this work has investigated the influence of the negative operator on universal quantifiers, making a comparison between the interpretations obtained by children and adults.

**d)** As regards bilingualism (psycholinguistics and sociolinguistics), this dissertation offers a picture of the interpretation of strong universal quantifiers, weak partial quantifiers, weak proportional quantifiers and of the interaction between universal quantifiers and the negative operator with 5-to-6-year-old Spanish monolingual children and Basque-dominant Basque-Spanish bilingual children.

This dissertation has tested a series of hypotheses, has answered the formulated research questions and has tested a set of predictions. Interestingly, many other new questions have arisen, for which an answer will try to be found in further work: first, a bigger population is needed for the study on different linguistic profiles, in order to see if a distinct quantity and quality of input (positively or negatively) affects the interpretations provided by children and adults. Moreover, empirical research with other Basque and Spanish quantifiers is necessary, so as to analyze if the derivation of a SI and the acquisition of the pragmatic meaning are influenced by the quantifier in question. Finally, we should conduct a study where the intonation in the audio-visual stimuli is controlled, in order to test if different intonation patterns have an effect on the resulting interpretation. These new studies would give us the opportunity to collect new data, make new predictions, postulate hypotheses, validate/refute old ones and, most importantly, keep on contributing to the field of language acquisition.

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# APPENDIX 1

## Experiment 1 (SET) - Version 1 (Spanish)

Fecha:

Participante:

Edad:

**EJERCICIO DE CALENTAMIENTO:**

| | | |
|---|---|---|
| Hay dos manzanas en las cajas. | CONT: 2/5 | B / M |
| Hay tres manzanas en las cajas. | CONT: 4/5 | B / M |
| Hay una manzana en las cajas. | CONT: 1/5 | B / M |
| Hay cuatro manzanas en las cajas. | CONT: 3/5 | B / M |
| Hay cinco manzanas en las cajas. | CONT: 5/5 | B / M |

**BLOQUE A:** COMENTARIOS

AC1: Todos los balones están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

NC1: Ninguno de los relojes está en las cajas.

CONT: 0/5 B / M si M ¿por qué?

SC1: Algunas naranjas están en las cajas.

CONT: 2/5 B / M si M ¿por qué?

SN2: Algunas guitarras no están en las cajas.

CONT: 0/5 B / M si M ¿por qué?

M1: La mayoría de las manzanas están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

NA1: No todos los jarrones están en las cajas.

CONT: 0/5 B / M si M ¿por qué?

S3: Algunos coches están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

MC4: La mayoría de los sándwiches están en las cajas.

CONT: 2/5 B / M si M ¿por qué?

NAC1: No todos los relojes están en las cajas.

CONT: 2/5 B / M si M ¿por qué?

SNC1: Algunos jarrones no están en las cajas.

CONT: 2/5 B / M si M ¿por qué?

**BLOQUE B:**

SNC2: Algunos zapatos no están en las cajas.

CONT: 2/5 B / M si M ¿por qué?

MC1: La mayoría de los jarrones están en las cajas.

CONT: 4/5 B / M si M ¿por qué?

SC4: Algunas faldas están en las cajas.

CONT: 0/5 B / M si M ¿por qué?

NAC6: No todas las camisetas están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

S1: Algunos relojes están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

AC4: Todos los sándwiches están en las cajas.

CONT: 2/5 B / M si M ¿por qué?

NC2: Ninguno de los plátanos está en las cajas.

CONT: 0/5 B / M si M ¿por qué?

M3: La mayoría de los ositos están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

SN3: Algunos ositos no están en las cajas.

CONT: 0/5 B / M si M ¿por qué?

NAC2: No todos los plátanos están en las cajas.

CONT: 2/5 B / M si M ¿por qué?

SNC6: Algunos sándwiches no están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

NA2: No todos los zapatos están en las cajas.

CONT: 0/5 B / M si M ¿por qué?

**DESCANSO 1:**

| | |
|---|---|
| 1. Señala el triángulo. | 1 – 0 – 0.5 |
| 2. Señala el círculo y luego el cuadrado. | 1 – 0 – 0.5 |
| 3. Señala todos los triángulos negros. | 1 – 0 – 0.5 |
| 4. Después de señalar el círculo, señala el cuadrado. | 1 – 0 – 0.5 |
| 5. Señala todas las figuras negras. | 1 – 0 – 0.5 |
| 6. Señala el cuadrado negro y luego señala el triángulo grande. | 1 – 0 – 0.5 |
| 7. Señala todas las formas que son blancas. | 1 – 0 – 0.5 |
| 8. Señala el triángulo que está más lejos del cuadrado. | 1 – 0 – 0.5 |
| 9. Antes de que señales los triángulos, señala el cuadrado. | 1 – 0 – 0.5 |
| 10. Señala el triángulo que está al lado del cuadrado negro. | 1 – 0 – 0.5 |
| 11. Señala todos los círculos que no son blancos. | 1 – 0 – 0.5 |
| 12. Señala el círculo después de señalar el cuadrado. | 1 – 0 – 0.5 |
| 13. Señala todas las figuras pequeñas. | 1 – 0 – 0.5 |
| 14. Señala el círculo y luego el cuadrado pequeño. | 1 – 0 – 0.5 |
| 15. Señala el círculo y luego el cuadrado negro. | 1 – 0 – 0.5 |
| 16. Señala todas las formas que no son negras. | 1 – 0 – 0.5 |

**BLOQUE C:**

AC2: Todos los dinosaurios están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

NA3: No todas las televisiones están en las cajas.

CONT: 0/5 B / M si M ¿por qué?

S2: Algunos plátanos están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

MC2: La mayoría de los zapatos están en las cajas.

CONT: 4/5 B / M si M ¿por qué?

NC4: Ninguno de los coches está en las cajas.

CONT: 2/5 B / M si M ¿por qué?

SNC4: Algunas televisiones no están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

M2: La mayoría de las guitarras están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

SC2: Algunos bolígrafos están en las cajas.

CONT: 2/5 B / M si M ¿por qué?

NAC4: No todas las faldas están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

SN1: Algunas manzanas no están en las cajas.

CONT: 0/5 B / M si M ¿por qué?

**BLOQUE D:**

AC3: Todos los bolígrafos están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

SC3: Algunas peras están en las cajas.

CONT: 2/5 B / M si M ¿por qué?

NC3: Ninguno de los balones está en las cajas.

CONT: 0/5 B / M si M ¿por qué?

MC6: La mayoría de los coches están en las cajas.

CONT: 2/5 B / M si M ¿por qué?

S4: Algunos teléfonos están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

SNC3: Algunos trenes no están en las cajas.

CONT: 2/5 B / M si M ¿por qué?

NA4: No todas las peras están en las cajas.

CONT: 0/5 B / M si M ¿por qué?

M4: La mayoría de los trenes están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

SN4: Algunos teléfonos no están en las cajas.

CONT: 0/5 B / M si M ¿por qué?

MC3: La mayoría de las muñecas están en las cajas.

CONT: 4/5 B / M si M ¿por qué?

AC6: Todas las camisetas están en las cajas.

CONT: 2/5 B / M si M ¿por qué?

**DESCANSO 2:**

| | | | | |
|---|---|---|---|---|
| 1. El lápiz. | 1 | 2 | 3 | 4 |
| 2. La estrella roja. | 1 | 2 | 3 | 4 |
| 3. La cuchara está fuera del círculo. | 1 | 2 | 3 | 4 |
| 4. La cesta pequeña está llena de manzanas. | 1 | 2 | 3 | 4 |
| 5. La pizza está dentro de la caja. | 1 | 2 | 3 | 4 |
| 6. La vela no está encima del armario. | 1 | 2 | 3 | 4 |
| 7. Sólo el tomate está dentro de la cesta. | 1 | 2 | 3 | 4 |
| 8. Todo menos el libro naranja está dentro del círculo. | 1 | 2 | 3 | 4 |
| 9. Sólo el robot está encima de un balón. | 1 | 2 | 3 | 4 |
| 10. El gato está encima de la mesa pero el ratón está debajo. | 1 | 2 | 3 | 4 |
| 11. La jirafa no está en el medio. | 1 | 2 | 3 | 4 |
| 12. La caja vacía está al lado de la mesa. | 1 | 2 | 3 | 4 |
| 13. Todo menos el teléfono es rojo. | 1 | 2 | 3 | 4 |
| 14. La mujer con el vestido naranja sujeta una flor amarilla. | 1 | 2 | 3 | 4 |

**BLOQUE E:**

SC5: Algunas manzanas están en las cajas.

CONT: 0/5 B / M si M ¿por qué?

M5: La mayoría de las naranjas están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

SC6: Algunas fresas están en las cajas.

CONT: 0/5 B / M si M ¿por qué?

S5: Algunas muñecas están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

NA5: No todas las fresas están en las cajas.

CONT: 0/5 B / M si M ¿por qué?

AC5: Todos los zapatos están en las cajas.

CONT: 2/5 B / M si M ¿por qué?

SN5: Algunas bicicletas no están en las cajas.

CONT: 0/5 B / M si M ¿por qué?

NAC5: No todas las flores están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

NC6: Ninguna de las faldas está en las cajas.

CONT: 2/5 B / M si M ¿por qué?

**BLOQUE F:**

M6: La mayoría de las fresas están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

SNC5: Algunos libros no están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

NC5: Ninguno de los globos está en las cajas.

CONT: 2/5 B / M si M ¿por qué?

S6: Algunas flores están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

NA6: No todos los libros están en las cajas.

CONT: 0/5 B / M si M ¿por qué?

SN6: Algunos dinosaurios no están en las cajas.

CONT: 0/5 B / M si M ¿por qué?

NAC3: No todos los teléfonos están en las cajas.

CONT: 2/5 B / M si M ¿por qué?

MC5: La mayoría de las bicicletas están en las cajas.

CONT: 2/5 B / M si M ¿por qué?

# APPENDIX 2

## Experiment 1 (SET) - Version 1 (Basque)

Data:

Partehartzailea:

Adina:

**BEROKETA SAIOA:**

| | |
|---|---|
| Bi sagar daude kutxetan. | KONT: 2/5 O / G |
| Hiru sagar daude kutxetan. | KONT: 4/5 O / G |
| Sagar bat dago kutxetan. | KONT: 1/5 O / G |
| Lau sagar daude kutxetan. | KONT: 3/5 O / G |
| Bost sagar daude kutxetan. | KONT: 5/5 O / G |

**A MULTZOA:** IRUZKINAK

AC1: Baloi guztiak kutxetan daude.

KONT: 5/5 O / G zergatik G?

NC1: Erloju bat ere ez dago kutxetan.

KONT: 0/5 O / G zergatik G?

SC1: Laranja batzuk kutxetan daude.

KONT: 2/5 O / G zergatik G?

SN2: Kitarra batzuk ez daude kutxetan.

KONT: 0/5 O / G zergatik G?

M1: Sagar gehienak kutxetan daude.

KONT: 5/5 O / G zergatik G?

NA1: Lorontzi guztiak ez daude kutxetan.

KONT: 0/5 O / G zergatik G?

S3: Kotxe batzuk kutxetan daude.

KONT: 5/5 O / G zergatik G?

MC4: Otarteko gehienak kutxetan daude.

KONT: 2/5 O / G zergatik G?

NAC1: Erloju guztiak ez daude kutxetan.

KONT: 2/5 O / G zergatik G?

SNC1: Lorontzi batzuk ez daude kutxetan.

KONT: 2/5 O / G zergatik G?

**B MULTZOA:**

SNC2: Zapata batzuk ez daude kutxetan.

KONT: 2/5 O / G zergatik G?

MC1: Lorontzi gehienak kutxetan daude.

KONT: 4/5 O / G zergatik G?

SC4: Gona batzuk kutxetan daude.

KONT: 0/5 O / G zergatik G?

NAC6: Niki guztiak ez daude kutxetan.

KONT: 5/5 O / G zergatik G?

S1: Erloju batzuk kutxetan daude.

KONT: 5/5 O / G zergatik G?

AC4: Otarteko guztiak kutxetan daude.

KONT: 2/5 O / G zergatik G?

NC2: Platano bat ere ez dago kutxetan.

KONT: 0/5 O / G zergatik G?

M3: Hartz gehienak kutxetan daude.

KONT: 5/5 O / G zergatik G?

SN3: Hartz batzuk ez daude kutxetan.

KONT: 0/5 O / G zergatik G?

NAC2: Platano guztiak ez daude kutxetan.

KONT: 2/5 O / G zergatik G?

SNC6: Otarteko batzuk ez daude kutxetan.

KONT: 5/5 O / G zergatik G?

NA2: Zapata guztiak ez daude kutxetan.

KONT: 0/5 O / G zergatik G?

**1. ETENA:**

| | |
|---|---|
| 1. Erakutsi hirukia. | 1 – 0 – 0.5 |
| 2. Erakutsi borobila, eta gero laukia. | 1 – 0 – 0.5 |
| 3. Erakutsi hiruki beltzak. | 1 – 0 – 0.5 |
| 4. Borobila erakutsi ondoren, laukia erakutsi. | 1 – 0 – 0.5 |
| 5. Erakutsi forma beltz guztiak. | 1 – 0 – 0.5 |
| 6. Erakutsi lauki beltza eta gero hiruki haundia. | 1 – 0 – 0.5 |
| 7. Erakutsi forma txuri guztiak. | 1 – 0 – 0.5 |
| 8. Erakutsi laukitik urrutien dagoen hirukia. | 1 – 0 – 0.5 |
| 9. Hirukiak erakutsi baino lehen, laukia erakutsi. | 1 – 0 – 0.5 |
| 10. Erakutsi lauki beltzaren ondoan dagoen hirukia. | 1 – 0 – 0.5 |
| 11. Erakutsi txuriak ez diren borobil guztiak. | 1 – 0 – 0.5 |
| 12. Erakutsi borobila, laukia erakutsi ondoren. | 1 – 0 – 0.5 |
| 13. Erakutsi forma txiki guztiak. | 1 – 0 – 0.5 |
| 14. Lauki txikia erakutsi baino lehen, erakutsi borobila. | 1 – 0 – 0.5 |
| 15. Erakutsi borobila eta ondoren lauki beltza. | 1 – 0 – 0.5 |
| 16. Erakutsi beltzak ez diren forma guztiak. | 1 – 0 – 0.5 |

**C MULTZOA:**

AC2: Dinosaurio guztiak kutxetan daude.

KONT: 5/5 O / G zergatik G?

NA3: Telebista guztiak ez daude kutxetan.

KONT: 0/5 O / G zergatik G?

S2: Platano batzuk kutxetan daude.

KONT: 5/5 O / G zergatik G?

MC2: Zapata gehienak kutxetan daude.

KONT: 4/5 O / G zergatik G?

NC4: Kotxe bat ere ez dago kutxetan.

KONT: 2/5 O / G zergatik G?

SNC4: Telebista batzuk ez daude kutxetan.

KONT: 5/5 O / G zergatik G?

M2: Kitarra gehienak kutxetan daude.

KONT: 5/5 O / G zergatik G?

SC2: Boligrafo batzuk kutxetan daude.

KONT: 2/5 O / G zergatik G?

NAC4: Gona guztiak ez daude kutxetan.

KONT: 5/5 O / G zergatik G?

SN1: Sagar batzuk ez daude kutxetan.

KONT: 0/5 O / G zergatik G?

**D MULTZOA:**

AC3: Boligrafo guztiak kutxetan daude.

KONT: 5/5 O / G zergatik G?

SC3: Urdare batzuk kutxetan daude.

KONT: 2/5 O / G zergatik G?

NC3: Baloi bat ere ez dago kutxetan.

KONT: 0/5 O / G zergatik G?

MC6: Kotxe gehienak kutxetan daude.

KONT: 2/5 O / G zergatik G?

S4: Telefono batzuk kutxetan daude.

KONT: 5/5 O / G zergatik G?

SNC3: Tren batzuk ez daude kutxetan.

KONT: 2/5 O / G zergatik G?

NA4: Urdare guztiak ez daude kutxetan.

KONT: 0/5 O / G zergatik G?

M4: Tren gehienak kutxetan daude.

KONT: 5/5 O / G zergatik G?

SN4: Telefono batzuk ez daude kutxetan.

KONT: 0/5 O / G zergatik G?

MC3: Panpin gehienak kutxetan daude.

KONT: 4/5 O / G zergatik G?

AC6: Niki guztiak kutxetan daude.

KONT: 2/5 O / G zergatik G?

**2. ETENA:**

1. Arkatza. 1 2 3 4
2. Izar gorria. 1 2 3 4
3. Kutxarea borobiletik kanpora dago. 1 2 3 4
4. Saski txikia sagarrez beteta dago. 1 2 3 4
5. Pizza kutxaren barruan dago. 1 2 3 4
6. Kandela ez dago armairuaren gainean. 1 2 3 4
7. Tomatea bakarrik dago saskian. 1 2 3 4
8. Liburu laranja izan ezik, beste guztia borobilaren barruan dago. 1 2 3 4
9. Robota bakarrik dago baloiaren gainean. 1 2 3 4
10. Katua mahaiaren gainean baina xagua mahaiaren azpian dago. 1 2 3 4
11. Jirafa ez dago erdian. 1 2 3 4
12. Altxor hutsa mahaiaren ondoan dago. 1 2 3 4
13. Telefonoa izan ezik beste guztia gorria da. 1 2 3 4
14. Soineko laranjadun emakumeak lore horia dauka. 1 2 3 4

**E MULTZOA:**

SC5: Sagar batzuk kutxetan daude.

KONT: 0/5 O / G zergatik G?

M5: Laranja gehienak kutxetan daude.

KONT: 5/5 O / G zergatik G?

SC6: Marrubi batzuk kutxetan daude.

KONT: 0/5 O / G zergatik G?

S5: Panpin batzuk kutxetan daude.

KONT: 5/5 O / G zergatik G?

NA5: Marrubi guztiak ez daude kutxetan.

KONT: 0/5 O / G zergatik G?

AC5: Oinetako guztiak kutxetan daude.

KONT: 2/5 O / G zergatik G?

SN5: Bizikleta batzuk ez daude kutxetan.

KONT: 0/5 O / G zergatik G?

NAC5: Lore guztiak ez daude kutxetan.

KONT: 5/5 O / G zergatik G?

NC6: Niki bat ere ez dago kutxetan.

KONT: 2/5 O / G zergatik G?

**F MULTZOA:**

M6: Marrubi gehienak kutxetan daude.

KONT: 5/5 O / G zergatik G?

SNC5: Liburu batzuk ez daude kutxetan.

KONT: 5/5 O / G zergatik G?

NC5: Puxika bat ere ez dago kutxetan.

KONT: 2/5 O / G zergatik G?

S6: Lore batzuk kutxetan daude.

KONT: 5/5 O / G zergatik G?

NA6: Liburu guztiak ez daude kutxetan.

KONT: 0/5 O / G zergatik G?

SN6: Dinosaurio batzuk ez daude kutxetan.

KONT: 0/5 O / G zergatik G?

NAC3: Telefono guztiak ez daude kutxetan.

KONT: 2/5 O / G zergatik G?

MC5: Bizikleta gehienak kutxetan daude.

KONT: 2/5 O / G zergatik G?

# APPENDIX 3

## Experiment 1 (SET) - Version 2 (Spanish)

Fecha:

Participante:

Edad:

**EJERCICIO DE CALENTAMIENTO:**

| | |
|---|---|
| Hay dos manzanas en las cajas. | CONT: 2/5 B / M |
| Hay tres manzanas en las cajas. | CONT: 4/5 B / M |
| Hay una manzana en las cajas. | CONT: 1/5 B / M |
| Hay cuatro manzanas en las cajas. | CONT: 3/5 B / M |
| Hay cinco manzanas en las cajas. | CONT: 5/5 B / M |

**BLOQUE A:** COMENTARIOS

AC1: Todos los balones están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

NC1: Ninguno de los relojes está en las cajas.

CONT: 0/5 B / M si M ¿por qué?

SC1: Algunas naranjas están en las cajas.

CONT: 2/5 B / M si M ¿por qué?

SN2: Algunas guitarras no están en las cajas.

CONT: 0/5 B / M si M ¿por qué?

M1: La mayoría de las manzanas están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

NA1: Todos los jarrones no están en las cajas.

CONT: 0/5 B / M si M ¿por qué?

S3: Algunos coches están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

MC4: La mayoría de los sándwiches están en las cajas.

CONT: 2/5 B / M si M ¿por qué?

NAC1: Todos los relojes no están en las cajas.

CONT: 2/5 B / M si M ¿por qué?

SNC1: Algunos jarrones no están en las cajas.

CONT: 2/5 B / M si M ¿por qué?

**BLOQUE B:**

SNC2: Algunos zapatos no están en las cajas.

CONT: 2/5 B / M si M ¿por qué?

MC1: La mayoría de los jarrones están en las cajas.

CONT: 4/5 B / M si M ¿por qué?

SC4: Algunas faldas están en las cajas.

CONT: 0/5 B / M si M ¿por qué?

NAC6: Todas las camisetas no están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

S1: Algunos relojes están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

AC4: Todos los sándwiches están en las cajas.

CONT: 2/5 B / M si M ¿por qué?

NC2: Ninguno de los plátanos está en las cajas.

CONT: 0/5 B / M si M ¿por qué?

M3: La mayoría de los ositos están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

SN3: Algunos ositos no están en las cajas.

CONT: 0/5 B / M si M ¿por qué?

NAC2: Todos los plátanos no están en las cajas.

CONT: 2/5 B / M si M ¿por qué?

SNC6: Algunos sándwiches no están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

NA2: Todos los zapatos no están en las cajas.

CONT: 0/5 B / M si M ¿por qué?

**DESCANSO 1:**

| | |
|---|---|
| 1. Señala el triángulo. | 1 – 0 – 0.5 |
| 2. Señala el círculo y luego el cuadrado. | 1 – 0 – 0.5 |
| 3. Señala todos los triángulos negros. | 1 – 0 – 0.5 |
| 4. Después de señalar el círculo, señala el cuadrado. | 1 – 0 – 0.5 |
| 5. Señala todas las figuras negras. | 1 – 0 – 0.5 |
| 6. Señala el cuadrado negro y luego señala el triángulo grande. | 1 – 0 – 0.5 |
| 7. Señala todas las formas que son blancas. | 1 – 0 – 0.5 |
| 8. Señala el triángulo que está más lejos del cuadrado. | 1 – 0 – 0.5 |
| 9. Antes de que señales los triángulos, señala el cuadrado. | 1 – 0 – 0.5 |
| 10. Señala el triángulo que está al lado del cuadrado negro. | 1 – 0 – 0.5 |
| 11. Señala todos los círculos que no son blancos. | 1 – 0 – 0.5 |
| 12. Señala el círculo después de señalar el cuadrado. | 1 – 0 – 0.5 |
| 13. Señala todas las figuras pequeñas. | 1 – 0 – 0.5 |
| 14. Señala el círculo y luego el cuadrado pequeño. | 1 – 0 – 0.5 |
| 15. Señala el círculo y luego el cuadrado negro. | 1 – 0 – 0.5 |
| 16. Señala todas las formas que no son negras. | 1 – 0 – 0.5 |

**BLOQUE C:**

AC2: Todos los dinosaurios están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

NA3: Todas las televisiones no están en las cajas.

CONT: 0/5 B / M si M ¿por qué?

S2: Algunos plátanos están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

MC2: La mayoría de los zapatos están en las cajas.

CONT: 4/5 B / M si M ¿por qué?

NC4: Ninguno de los coches está en las cajas.

CONT: 2/5 B / M si M ¿por qué?

SNC4: Algunas televisiones no están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

M2: La mayoría de las guitarras están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

SC2: Algunos bolígrafos están en las cajas.

CONT: 2/5 B / M si M ¿por qué?

NAC4: Todas las faldas no están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

SN1: Algunas manzanas no están en las cajas.

CONT: 0/5 B / M si M ¿por qué?

**BLOQUE D:**

AC3: Todos los bolígrafos están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

SC3: Algunas peras están en las cajas.

CONT: 2/5 B / M si M ¿por qué?

NC3: Ninguno de los balones está en las cajas.

CONT: 0/5 B / M si M ¿por qué?

MC6: La mayoría de los coches están en las cajas.

CONT: 2/5 B / M si M ¿por qué?

S4: Algunos teléfonos están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

SNC3: Algunos trenes no están en las cajas.

CONT: 2/5 B / M si M ¿por qué?

NA4: Todas las peras no están en las cajas.

CONT: 0/5 B / M si M ¿por qué?

M4: La mayoría de los trenes están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

SN4: Algunos teléfonos no están en las cajas.

CONT: 0/5 B / M si M ¿por qué?

MC3: La mayoría de las muñecas están en las cajas.

CONT: 4/5 B / M si M ¿por qué?

AC6: Todas las camisetas están en las cajas.

CONT: 2/5 B / M si M ¿por qué?

**DESCANSO 2:**

| | | | | |
|---|---|---|---|---|
| 1. El lápiz. | 1 | 2 | 3 | 4 |
| 2. La estrella roja. | 1 | 2 | 3 | 4 |
| 3. La cuchara está fuera del círculo. | 1 | 2 | 3 | 4 |
| 4. La cesta pequeña está llena de manzanas. | 1 | 2 | 3 | 4 |
| 5. La pizza está dentro de la caja. | 1 | 2 | 3 | 4 |
| 6. La vela no está encima del armario. | 1 | 2 | 3 | 4 |
| 7. Sólo el tomate está dentro de la cesta. | 1 | 2 | 3 | 4 |
| 8. Todo menos el libro naranja está dentro del círculo. | 1 | 2 | 3 | 4 |
| 9. Sólo el robot está encima de un balón. | 1 | 2 | 3 | 4 |
| 10. El gato está encima de la mesa pero el ratón está debajo. | 1 | 2 | 3 | 4 |
| 11. La jirafa no está en el medio. | 1 | 2 | 3 | 4 |
| 12. La caja vacía está al lado de la mesa. | 1 | 2 | 3 | 4 |
| 13. Todo menos el teléfono es rojo. | 1 | 2 | 3 | 4 |
| 14. La mujer con el vestido naranja sujeta una flor amarilla. | 1 | 2 | 3 | 4 |

**BLOQUE E:**

SC5: Algunas manzanas están en las cajas.

CONT: 0/5 B / M si M ¿por qué?

M5: La mayoría de las naranjas están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

SC6: Algunas fresas están en las cajas.

CONT: 0/5 B / M si M ¿por qué?

S5: Algunas muñecas están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

NA5: Todas las fresas no están en las cajas.

CONT: 0/5 B / M si M ¿por qué?

AC5: Todos los zapatos están en las cajas.

CONT: 2/5 B / M si M ¿por qué?

SN5: Algunas bicicletas no están en las cajas.

CONT: 0/5 B / M si M ¿por qué?

NAC5: Todas las flores no están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

NC6: Ninguna de las faldas está en las cajas.

CONT: 2/5 B / M si M ¿por qué?

**BLOQUE F:**

M6: La mayoría de las fresas están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

SNC5: Algunos libros no están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

NC5: Ninguno de los globos está en las cajas.

CONT: 2/5 B / M si M ¿por qué?

S6: Algunas flores están en las cajas.

CONT: 5/5 B / M si M ¿por qué?

NA6: Todos los libros no están en las cajas.

CONT: 0/5 B / M si M ¿por qué?

SN6: Algunos dinosaurios no están en las cajas.

CONT: 0/5 B / M si M ¿por qué?

NAC3: Todos los teléfonos no están en las cajas.

CONT: 2/5 B / M si M ¿por qué?

MC5: La mayoría de las bicicletas están en las cajas.

CONT: 2/5 B / M si M ¿por qué?

# APPENDIX 4

## Experiment 1 (SET) – Version 2 (Basque)

Data:

Partehartzailea:

Adina:

**BEROKETA SAIOA:**

| | |
|---|---|
| Bi sagar daude kutxetan. | KONT: 2/5 O / G |
| Hiru sagar daude kutxetan. | KONT: 4/5 O / G |
| Sagar bat dago kutxetan. | KONT: 1/5 O / G |
| Lau sagar daude kutxetan. | KONT: 3/5 O / G |
| Bost sagar daude kutxetan. | KONT: 5/5 O / G |

**A MULTZOA:** IRUZKINAK

AC1: Baloi guztiak kutxetan daude.

KONT: 5/5 O / G zergatik G?

NC1: Ez dago erloju bat ere kutxetan.

KONT: 0/5 O / G zergatik G?

SC1: Laranja batzuk kutxetan daude.

KONT: 2/5 O / G zergatik G?

SN2: Ez daude kitarra batzuk kutxetan.

KONT: 0/5 O / G zergatik G?

M1: Sagar gehienak kutxetan daude.

KONT: 5/5 O / G zergatik G?

NA1: Ez daude lorontzi guztiak kutxetan.

KONT: 0/5 O / G zergatik G?

S3: Kotxe batzuk kutxetan daude.

KONT: 5/5 O / G zergatik G?

MC4: Otarteko gehienak kutxetan daude.

KONT: 2/5 O / G zergatik G?

NAC1: Ez daude erloju guztiak kutxetan.

KONT: 2/5 O / G zergatik G?

SNC1: Ez daude lorontzi batzuk kutxetan.

KONT: 2/5 O / G zergatik G?

**B MULTZOA:**

SNC2: Ez daude zapata batzuk kutxetan.

KONT: 2/5 O / G zergatik G?

MC1: Lorontzi gehienak kutxetan daude.

KONT: 4/5 O / G zergatik G?

SC4: Gona batzuk kutxetan daude.

KONT: 0/5 O / G zergatik G?

NAC6: Ez daude niki guztiak kutxetan.

KONT: 5/5 O / G zergatik G?

S1: Erloju batzuk kutxetan daude.

KONT: 5/5 O / G zergatik G?

AC4: Otarteko guztiak kutxetan daude.

KONT: 2/5 O / G zergatik G?

NC2: Ez dago platano bat ere kutxetan.

KONT: 0/5 O / G zergatik G?

M3: Hartz gehienak kutxetan daude.

KONT: 5/5 O / G zergatik G?

SN3: Ez daude hartz batzuk kutxetan.

KONT: 0/5 O / G zergatik G?

NAC2: Ez daude platano guztiak kutxetan.

KONT: 2/5 O / G zergatik G?

SNC6: Ez daude otarteko batzuk kutxetan.

KONT: 5/5 O / G zergatik G?

NA2: Ez daude zapata guztiak kutxetan.

KONT: 0/5 O / G zergatik G?

**1. ETENA:**

17. Erakutsi hirukia . 1 – 0 – 0.5
18. Erakutsi borobila, eta gero laukia. 1 – 0 – 0.5
19. Erakutsi hiruki beltzak. 1 – 0 – 0.5
20. Borobila erakutsi ondoren, laukia erakutsi. 1 – 0 – 0.5
21. Erakutsi forma beltz guztiak. 1 – 0 – 0.5
22. Erakutsi lauki beltza eta gero hiruki haundia. 1 – 0 – 0.5
23. Erakutsi forma txuri guztiak. 1 – 0 – 0.5
24. Erakutsi laukitik urrutien dagoen hirukia. 1 – 0 – 0.5
25. Hirukiak erakutsi baino lehen, laukia erakutsi. 1 – 0 – 0.5
26. Erakutsi lauki beltzaren ondoan dagoen hirukia. 1 – 0 – 0.5
27. Erakutsi txuriak ez diren borobil guztiak. 1 – 0 – 0.5
28. Erakutsi borobila, laukia erakutsi ondoren. 1 – 0 – 0.5
29. Erakutsi forma txiki guztiak. 1 – 0 – 0.5
30. Lauki txikia erakutsi baino lehen, erakutsi borobila. 1 – 0 – 0.5
31. Erakutsi borobila eta ondoren lauki beltza. 1 – 0 – 0.5
32. Erakutsi beltzak ez diren forma guztiak. 1 – 0 – 0.5

**C MULTZOA:**

AC2: Dinosaurio guztiak kutxetan daude.

KONT: 5/5 O / G zergatik G?

NA3: Ez daude telebista guztiak kutxetan.

KONT: 0/5 O / G zergatik G?

S2: Platano batzuk kutxetan daude.

KONT: 5/5 O / G zergatik G?

MC2: Zapata gehienak kutxetan daude.

KONT: 4/5 O / G zergatik G?

NC4: Ez dago kotxe bat ere kutxetan.

KONT: 2/5 O / G zergatik G?

SNC4: Ez daude telebista batzuk kutxetan.

KONT: 5/5 O / G zergatik G?

M2: Kitarra gehienak kutxetan daude.

KONT: 5/5 O / G zergatik G?

SC2: Boligrafo batzuk kutxetan daude.

KONT: 2/5 O / G zergatik G?

NAC4: Ez daude gona guztiak kutxetan.

KONT: 5/5 O / G zergatik G?

SN1: Ez daude sagar batzuk kutxetan.

KONT: 0/5 O / G zergatik G?

**D MULTZOA:**

AC3: Boligrafo guztiak kutxetan daude.

KONT: 5/5 O / G zergatik G?

SC3: Urdare batzuk kutxetan daude.

KONT: 2/5 O / G zergatik G?

NC3: Ez dago baloi bat ere kutxetan.

KONT: 0/5 O / G zergatik G?

MC6: Kotxe gehienak kutxetan daude.

KONT: 2/5 O / G zergatik G?

S4: Telefono batzuk kutxetan daude.

KONT: 5/5 O / G zergatik G?

SNC3: Ez daude tren batzuk kutxetan.

KONT: 2/5 O / G zergatik G?

NA4: Ez daude urdare guztiak kutxetan.

KONT: 0/5 O / G zergatik G?

M4: Tren gehienak kutxetan daude.

KONT: 5/5 O / G zergatik G?

SN4: Ez daude telefono batzuk kutxetan.

KONT: 0/5 O / G zergatik G?

MC3: Panpin gehienak kutxetan daude.

KONT: 4/5 O / G zergatik G?

AC6: Niki guztiak kutxetan daude.

KONT: sub O / G zergatik G?

**2. ETENA:**

1. Arkatza. 1 2 3 4
2. Izar gorria. 1 2 3 4
3. Kutxarea borobiletik kanpora dago. 1 2 3 4
4. Saski txikia sagarrez beteta dago. 1 2 3 4
5. Pizza kutxaren barruan dago. 1 2 3 4
6. Kandela ez dago armairuaren gainean. 1 2 3 4
7. Tomatea bakarrik dago saskian. 1 2 3 4
8. Liburu laranja izan ezik, beste guztia borobilaren barruan dago. 1 2 3 4
9. Robota bakarrik dago baloiaren gainean. 1 2 3 4
10. Katua mahaiaren gainean baina xagua mahaiaren azpian dago. 1 2 3 4
11. Jirafa ez dago erdian. 1 2 3 4
12. Altxor hutsa mahaiaren ondoan dago. 1 2 3 4
13. Telefonoa izan ezik beste guztia gorria da. 1 2 3 4
14. Soineko laranjadun emakumeak lore horia dauka. 1 2 3 4

**E MULTZOA:**

SC5: Sagar batzuk kutxetan daude.

KONT: 0/5 O / G zergatik G?

M5: Laranja gehienak kutxetan daude.

KONT: 5/5 O / G zergatik G?

SC6: Marrubi batzuk kutxetan daude.

KONT: 0/5 O / G zergatik G?

S5: Panpin batzuk kutxetan daude.

KONT: 5/5 O / G zergatik G?

NA5: Ez daude marrubi guztiak kutxetan.

KONT: 0/5 O / G zergatik G?

AC5: Oinetako guztiak kutxetan daude.

KONT: 2/5 O / G zergatik G?

SN5: Ez daude bizikleta batzuk kutxetan.

KONT: 0/5 O / G zergatik G?

NAC5: Ez daude lore guztiak kutxetan.

KONT: 5/5 O / G zergatik G?

NC6: Ez dago niki bat ere kutxetan.

KONT: 2/5 O / G zergatik G?

**F MULTZOA:**

M6: Marrubi gehienak kutxetan daude.

KONT: 5/5 O / G zergatik G?

SNC5: Ez daude liburu batzuk kutxetan.

KONT: 5/5 O / G zergatik G?

NC5: Ez dago puxika bat ere kutxetan.

KONT: 2/5 O / G zergatik G?

S6: Lore batzuk kutxetan daude.

KONT: 5/5 O / G zergatik G?

NA6: Ez daude liburu guztiak kutxetan.

KONT: 0/5 O / G zergatik G?

SN6: Ez daude dinosaurio batzuk kutxetan.

KONT: 0/5 O / G zergatik G?

NAC3: Ez daude telefono guztiak kutxetan.

KONT: 2/5 O / G zergatik G?

MC5: Bizikleta gehienak kutxetan daude.

KONT: 2/5 O / G zergatik G?

# APPENDIX 5

## Experiment 2 (PST) – Spanish

Nombre y Apellidos: Lengua Prueba: Castellano

Fecha Nacimiento: Fecha Prueba:

**ENTRENAMIENTO:**

1. Hay dos manzanas en las cajas. Izquierda / Derecha
2. Hay tres manzanas en las cajas. Izquierda / Derecha
3. Hay una manzana en las cajas. Izquierda / Derecha
4. Hay cuatro manzanas en las cajas. Izquierda / Derecha
5. Hay cinco manzanas en las cajas. Izquierda / Derecha

**PRUEBA:**

6. No todos los jarrones están en las cajas. Izquierda / Derecha
7. Todas las faldas no están en las cajas. Izquierda / Derecha
8. Algunos coches están en las cajas. Izquierda / Derecha
9. No todas las faldas están en las cajas. Izquierda / Derecha
10. Todos los relojes no están en las cajas. Izquierda / Derecha
11. No todas las televisiones están en las cajas. Izquierda / Derecha
12. La vela no está encima del armario.
    Arr Izq / Arr Der /Aba Izq / Aba Der
13. Algunos relojes están en las cajas. Izquierda / Derecha
14. No todas las camisetas están en las cajas. Izquierda / Derecha
15. Ninguno de los relojes está en las cajas. Izquierda / Derecha
16. Ninguna de las faldas está en las cajas. Izquierda / Derecha
17. Todos los plátanos no están en las cajas. Izquierda / Derecha
18. Todos los relojes no están en las cajas. Izquierda / Derecha
19. Sólo el tomate está dentro de la cesta.
    Arr Izq / Arr Der /Aba Izq / Aba Der

20. Ninguno de los coches está en las cajas. Izquierda / Derecha
21. No todas las televisiones están en las cajas. Izquierda / Derecha
22. Algunos plátanos están en las cajas. Izquierda / Derecha
23. No todos los plátanos están en las cajas. Izquierda / Derecha
24. No todos los relojes están en las cajas. Izquierda / Derecha
25. Algunos relojes están en las cajas. Izquierda / Derecha
26. No todas las camisetas están en las cajas. Izquierda / Derecha
27. Todo menos el libro naranja está dentro del círculo.
    Arr Izq / Arr Der /Aba Izq / Aba Der
28. Todas las camisetas no están en las cajas. Izquierda / Derecha
29. Ninguno de los plátanos está en las cajas. Izquierda / Derecha
30. No todos los relojes están en las cajas. Izquierda / Derecha
31. Ninguna de las faldas está en las cajas. Izquierda / Derecha
32. Todas las televisiones no están en las cajas. Izquierda / Derecha
33. Ninguno de los plátanos está en las cajas. Izquierda / Derecha
34. Algunos relojes están en las cajas. Izquierda / Derecha
35. Sólo el robot está encima de un balón.
    Arr Izq / Arr Der /Aba Izq / Aba Der
36. Ninguno de los relojes está en las cajas. Izquierda / Derecha
37. Algunos relojes están en las cajas. Izquierda / Derecha
38. Ninguno de los coches está en las cajas. Izquierda / Derecha
39. Algunas faldas están en las cajas. Izquierda / Derecha
40. El gato está encima de la mesa, pero el ratón está debajo.
    Arr Izq / Arr Der /Aba Izq / Aba Der
41. Algunas faldas están en las cajas. Izquierda / Derecha
42. Ninguno de los plátanos está en las cajas. Izquierda / Derecha
43. No todas las faldas están en las cajas. Izquierda / Derecha
44. Algunos plátanos están en las cajas. Izquierda / Derecha
45. Todas las televisiones no están en las cajas. Izquierda / Derecha
46. Ninguno de los relojes está en las cajas. Izquierda / Derecha
47. La jirafa no está en el medio.

Arr Izq / Arr Der /Aba Izq / Aba Der

48. Todos los jarrones no están en las cajas. Izquierda / Derecha
49. Algunos plátanos están en las cajas. Izquierda / Derecha
50. Algunos coches están en las cajas. Izquierda / Derecha
51. Ninguno de los plátanos está en las cajas. Izquierda / Derecha
52. La caja vacía está al lado de la mesa.

Arr Izq / Arr Der /Aba Izq / Aba Der

53. No todos los plátanos están en las cajas. Izquierda / Derecha
54. Todas las camisetas no están en las cajas. Izquierda / Derecha
55. No todos los jarrones están en las cajas. Izquierda / Derecha
56. Ninguno de los relojes está en las cajas. Izquierda / Derecha
57. Todo menos el teléfono es rojo.

Arr Izq / Arr Der /Aba Izq / Aba Der

58. Todos los jarrones no están en las cajas. Izquierda / Derecha
59. Algunos plátanos están en las cajas. Izquierda / Derecha
60. Todos los plátanos no están en las cajas. Izquierda / Derecha
61. Todas las faldas no están en las cajas. Izquierda / Derecha

# APPENDIX 6

## Experiment 2 (PST) – Basque

Izen-abizenak: Frogaren Hizkuntza: Euskara

Jaioteguna: Frogaren Data:

**ENTRENAMENDUA:**

1. Bi sagar daude kutxetan. Ezker / Eskuin
2. Hiru sagar daude kutxetan. Ezker / Eskuin
3. Sagar bat dago kutxetan. Ezker / Eskuin
4. Lau sagar daude kutxetan. Ezker / Eskuin
5. Bost sagar daude kutxetan. Ezker / Eskuin

**FROGA:**

6. Ez daude lorontzi guztiak kutxetan. Ezker / Eskuin
7. Gona guztiak ez daude kutxetan. Ezker / Eskuin
8. Kotxe batzuk kutxetan daude. Ezker / Eskuin
9. Ez daude gona guztiak kutxetan. Ezker / Eskuin
10. Erloju guztiak ez daude kutxetan. Ezker / Eskuin
11. Ez daude telebista guztiak kutxetan. Ezker / Eskuin
12. Kandela ez dago armairuaren gainean.
    Goi Ezk/Goi Esk/Azp Ezk/Azp Esk
13. Erloju batzuk kutxetan daude. Ezker / Eskuin
14. Ez daude niki guztiak kutxetan. Ezker / Eskuin
15. Erloju bat ere ez dago kutxetan. Ezker / Eskuin
16. Gona bat ere ez dago kutxetan. Ezker / Eskuin
17. Platano guztiak ez daude kutxetan. Ezker / Eskuin
18. Erloju guztiak ez daude kutxetan. Ezker / Eskuin
19. Tomatea bakarrik dago saskian.
    Goi Ezk/Goi Esk/Azp Ezk/Azp Esk

20. Kotxe bat ere ez dago kutxetan. Ezker / Eskuin
21. Ez daude telebista guztiak kutxetan. Ezker / Eskuin
22. Platano batzuk kutxetan daude. Ezker / Eskuin
23. Ez daude platano guztiak kutxetan. Ezker / Eskuin
24. Ez daude erloju guztiak kutxetan. Ezker / Eskuin
25. Erloju batzuk kutxetan daude. Ezker / Eskuin
26. Ez daude niki guztiak kutxetan. Ezker / Eskuin
27. Liburu laranja izan ezik, beste guztia borobilaren barruan dago.
    Goi Ezk/Goi Esk/Azp Ezk/Azp Esk
28. Niki guztiak ez daude kutxetan. Ezker / Eskuin
29. Platano bat ere ez dago kutxetan. Ezker / Eskuin
30. Ez daude erloju guztiak kutxetan. Ezker / Eskuin
31. Gona bat ere ez dago kutxetan. Ezker / Eskuin
32. Telebista guztiak ez daude kutxetan. Ezker / Eskuin
33. Platano bat ere ez dago kutxetan. Ezker / Eskuin
34. Erloju batzuk kutxetan daude. Ezker / Eskuin
35. Robota bakarrik dago baloiaren gainean.
    Goi Ezk/Goi Esk/Azp Ezk/Azp Esk
36. Erloju bat ere ez dago kutxetan. Ezker / Eskuin
37. Erloju batzuk kutxetan daude. Ezker / Eskuin
38. Kotxe bat ere ez dago kutxetan. Ezker / Eskuin
39. Gona batzuk kutxetan daude. Ezker / Eskuin
40. Katua mahaiaren gainean, baina sagua mahaiaren azpian dago.
    Goi Ezk/Goi Esk/Azp Ezk/Azp Esk
41. Gona batzuk kutxetan daude. Ezker / Eskuin
42. Platano bat ere ez dago kutxetan. Ezker / Eskuin
43. Ez daude gona guztiak kutxetan. Ezker / Eskuin
44. Platano batzuk kutxetan daude. Ezker / Eskuin
45. Telebista guztiak ez daude kutxetan. Ezker / Eskuin
46. Erloju bat ere ez dago kutxetan. Ezker / Eskuin
47. Jirafa ez dago erdian.

Goi Ezk/Goi Esk/Azp Ezk/Azp Esk

48. Lorontzi guztiak ez daude kutxetan. Ezker / Eskuin
49. Platano batzuk kutxetan daude. Ezker / Eskuin
50. Kotxe batzuk kutxetan daude. Ezker / Eskuin
51. Platano bat ere ez dago kutxetan. Ezker / Eskuin
52. Altxor hutsa mahaiaren ondoan dago.

Goi Ezk/Goi Esk/Azp Ezk/Azp Esk

53. Ez daude platano guztiak kutxetan. Ezker / Eskuin
54. Niki guztiak ez daude kutxetan. Ezker / Eskuin
55. Ez daude lorontzi guztiak kutxetan. Ezker / Eskuin
56. Erloju bat ere ez dago kutxetan. Ezker / Eskuin
57. Telefonoa izan ezik, beste guztia gorria da.

Goi Ezk/Goi Esk/Azp Ezk/Azp Esk

58. Lorontzi guztiak ez daude kutxetan. Ezker / Eskuin
59. Platano batzuk kutxetan daude. Ezker / Eskuin
60. Platano guztiak ez daude kutxetan. Ezker / Eskuin
61. Gona guztiak ez daude kutxetan. Ezker / Eskuin

# APPENDIX 7

## Parents' consent + Linguistic questionnaire

PARTE HARTZEKO BAIMENA ETA IKASLEAREN DATUAK / AUTORIZACIÓN PARA PARTICIPAR EN EL ESTUDIO Y DATOS DEL ALUMNO o ALUMNA

Izen-abizenak/ Nombre y apellidos: _____ (edo ezizena / o pseudónimo)

Jaiotze-data / Fecha de nacimiento: _____

Jaioterria / Lugar de nacimiento: _____

Bizilekua / Lugar de residencia: _____

Etxekoekin haurrak erabiltzen dituen **hizkuntzak** / **Lenguas** que usa el niño en su entorno familiar:

_____hizkuntza aitarekin / lengua con el padre: ___ ordu astean / horas a la semana

_____hizkuntza amarekin / lengua con la madre: ___ ordu astean / horas a la semana

_____ aitaren aldeko aiton-amonekin / con los abuelos paternos: ___ ordu astean/ horas a la semana

_____amaren aldeko aiton-amonekin / con los abuelos maternos: ___ ordu astean/ horas a la semana

_____beste batzuekin (esan norekin) / otras personas (indíquese quién): ___ ordu astean/ horas a la semana

☐ Nahi dut haurrak parte hartzea
Deseo que participe

☐ Ez dut parte hartzerik nahi
No deseo que participe

Gurasoaren sinadura/ Firma del padre o de la madre:

_____