**Short Visit Grant**

***Scientific Report***

Proposal title: *International Association Norms Database & DRM International Database*

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Host institution research leader: *Prof. Maria Soledad Beato Gutierrez, Salamanca University, Salamanca, Spain.*

**Purpose of the visit**

The main purposes of the visit has been:

1. To test associative norms of 100 spanish words collected using survey online;
2. To compare it with *Normas de Asociación Libre* (Fernández, Diez, & Alonso, 2004);
3. To norm 16 Spanish DRM lists created from *Backward Associative Norms*.

**Description of the work carried out during the visit**

Here I describe the work carried out in chronological order. However we start subsequent phases also when the previous phase was in progress.

**Associations of 100 words-cue**

The first step of the work was to select 100 words in order to create associative norms using survey online. We decided to test 55 critical words from a previous study using DRM lists in Spanish (Alonso, Fernández, Díez, & Beato, 2004) and 45 spanish words randomly selected from *Normas de Asociación Libre* (Fernández, Diez, & Alonso, 2004). Therefore we create a survey on-line in which participant could insert words associate to 100 word cue, in a discrete associative task. Thus we spread the link in using privates email contacts and email contact of students of University of Salamanca. Data analysis were compared with data of exactly the same words from *Normas de Asociación Libre* (Fernández, Diez, & Alonso, 2004).

**DRM Lists**

On the other side we created 16 DRM lists starting from 16 critical lures that weren’t included in the lists. Each list contained 12 words backward associated to a critical lure and were presented in fixed order from the most associated to the less associated. In order to compute the associative strength indexes we referred to *Normas de Asociación Libre* database (Fernández, Diez, & Alonso, 2004). We tested 8 lists with high BAS mean and 8 lists with low BAS mean.

Lists were randomly presented to 43 participants, that were undergraduate student of University of Salamanca in Spain. Between each presentation there was one minute in which participants have to recall words contained in list or to solve arithmetic operation. We gave to participants two conditions. In the first condition, after the presentation of each list participants have one minute to recall all the words they could until the 8th list, than they have to fill the recognition task. In the second condition instead, participants have one minute to solve as many mathematical operations (additions and subtractions) they could, and after the eight they have to fill another recognition task. The two conditions was alternated and submitted to all the participants.

At least we asked to 15 subjects to read again all the lists and for each list to write down the critical lure that they guessed.

**Description of the main results obtained**

**Associations of 100 words-cue**

We collect 254 responses online but we eliminated 14 responses because comes from not Spanish native speakers. At least we analyzed 238 responses (female = 204; mean age = 20,98; SD = 4,76). Participants produced 5525 associated words to 100 cue that we compared with 6325 associated words present in Spanish Norms (Fernández, Diez, & Alonso, 2004). Our analysis on 1898 pair of proportion association value shows high correlation [r(1898) = .89; p< .000] between proportion of associated words presented in data carried out from our survey online and Spanish Norms (Fernández, Diez, & Alonso, 2004). Furthermore associative data from our survey contain a similar number of idiosyncratic responses (Freq. = 3399) with respect to Spanish norms (Freq. = 3985) and similar number of unique responses (). This result demonstrate that online survey could be used confidently as research method in order to collect data for associative norms.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Survey on-line | |  | Spanish Norms | |
| Common | 1898 | 34% |  | 1898 | 30% |
| Idiosyncratic | 3399 | 62% |  | 3985 | 63% |
| Unique | 228 | 4% |  | 442 | 7% |
| Total | 5525 | 100% |  | 6325 | 100% |

Table 1. Comparison of Association of 100 words of our survey on-line and Association of Spanish Norms (Fernández, Diez, & Alonso, 2004)

**DRM Lists**

We created 16 spanish DRM lists and than we collected responses of 43 subject, but we excluded from analysis one participant because wasn’t Spanish native speaker.

**Recall**

Data from the lists showed great variability in the probability that the different lists would produce illusory memories (). For example, *corona, arma* and *flor* list resulted very few critical lures being recalled, whereas *caja* was the critical lures more probably recalled (.55). Overall, our lists were more likely to produce correct recall (M = .67, SD = .06) than critical recall (M = .18, SD = .15) [t(42) = 10,56, p < .001].

|  |  |  |  |
| --- | --- | --- | --- |
| List | Correct | False Recall | Intrusions |
| PERRO | 0,71 | 0,14 | 0 |
| FLOR | 0,66 | 0,00 | 0,07 |
| LIBRO | 0,74 | 0,05 | 0,02 |
| OJO | 0,73 | 0,14 | 0,12 |
| CÁRCEL | 0,59 | 0,23 | 0,02 |
| FIESTA | 0,62 | 0,32 | 0,05 |
| AVIÓN | 0,67 | 0,19 | 0,14 |
| GATO | 0,64 | 0,23 | 0,16 |
| ARMA | 0,65 | 0,00 | 0,07 |
| CAJA | 0,55 | 0,55 | 0,09 |
| CANCIÓN | 0,71 | 0,14 | 0,07 |
| BESO | 0,72 | 0,14 | 0,02 |
| LÁMPARA | 0,67 | 0,24 | 0,07 |
| BOTELLA | 0,75 | 0,41 | 0,09 |
| HORROR | 0,58 | 0,14 | 0,26 |
| CORONA | 0,73 | 0,00 | 0,07 |
| Mean | **0,67 (0,06)** | **0,18 (0,15)** | **0,08 (0,06)** |

Table 2. Data Recall 16 lists

**Recognition**

Each participant did two recognition tasks, each after eight lists randomly presented visually. We tested the hypothesis that the recall task affects the recognition task. In order to test this hypothesis we collect recognition responses after have been presented eight lists after which participants have to recall as many words they could from the previous lists. The second recognition task was fill after eight lists after which people have to solve simple mathematical operations (control condition).

(Table 3) report data of the two recognition tasks.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| list | After Recall Task | | |  | After Math Operations | | |  | Difference | | |
| hits | CL | RnP |  | hits | CL | RnP |  | hits | CL | RnP |
| PERRO | 0,88 | 0,30 | 0,06 |  | 0,72 | 0,68 | 0,04 |  | 0,16 | -0,38 | 0,03 |
| FLOR | 0,93 | 0,58 | 0,17 |  | 0,77 | 0,76 | 0,28 |  | 0,16 | -0,18 | -0,11 |
| LIBRO | 0,90 | 0,56 | 0,28 |  | 0,72 | 0,78 | 0,47 |  | 0,18 | -0,22 | -0,19 |
| OJO | 0,91 | 0,69 | 0,12 |  | 0,81 | 0,54 | 0,13 |  | 0,10 | 0,14 | -0,02 |
| CÁRCEL | 0,95 | 0,87 | 0,21 |  | 0,93 | 0,58 | 0,47 |  | 0,02 | 0,28 | -0,25 |
| FIESTA | 0,93 | 0,30 | 0,26 |  | 0,73 | 0,71 | 0,16 |  | 0,21 | -0,40 | 0,10 |
| AVIÓN | 0,95 | 0,34 | 0,10 |  | 0,80 | 0,71 | 0,10 |  | 0,14 | -0,37 | 0,00 |
| GATO | 0,88 | 0,23 | 0,06 |  | 0,93 | 0,50 | 0,13 |  | -0,05 | -0,26 | -0,06 |
| ARMA | 0,78 | 0,56 | 0,14 |  | 0,95 | 0,64 | 0,38 |  | -0,17 | -0,08 | -0,24 |
| CAJA | 0,80 | 0,07 | 0,13 |  | 0,58 | 0,34 | 0,18 |  | 0,22 | -0,27 | -0,04 |
| CANCIÓN | 0,82 | 0,38 | 0,32 |  | 0,76 | 0,49 | 0,62 |  | 0,06 | -0,12 | -0,30 |
| BESO | 0,94 | 0,39 | 0,29 |  | 0,88 | 0,72 | 0,46 |  | 0,07 | -0,33 | -0,16 |
| LÁMPARA | 0,88 | 0,57 | 0,06 |  | 0,81 | 0,73 | 0,00 |  | 0,07 | -0,16 | 0,06 |
| BOTELLA | 0,98 | 0,08 | 0,13 |  | 0,87 | 0,75 | 0,29 |  | 0,11 | -0,67 | -0,16 |
| HORROR | 0,75 | 0,30 | 0,37 |  | 0,70 | 0,56 | 0,60 |  | 0,05 | -0,26 | -0,23 |
| CORONA | 0,92 | 0,33 | 0,06 |  | 0,79 | 0,50 | 0,00 |  | 0,13 | -0,17 | 0,06 |
| media | **0,89** | **0,41** | **0,17** |  | **0,80** | **0,62** | **0,27** |  | **0,09** | **-0,22** | **-0,09** |
| ds | **0,07** | **0,21** | **0,10** |  | **0,10** | **0,13** | **0,21** |  | **0,10** | **0,22** | **0,13** |

Table 3. Recognition mean proportion of 16 DRM lists. After recall = Participant after each of eight lists had to do the recall task and after the eight they fill the recognition task; After Math Operations = Participant after each of eight lists had to solve as many simply mathematical operations could and after the eight they fill the recognition task; Delta = Differences between means proportions of the after recall condition and math operation condition; Hits=correct recognition; CL= critical lure; RnP = Related not Presented; nRnP = not Related not Presented.

Using an ANOVA within we find that recall task significantly influence the recognition of presented words [t(15) = 3.64, p< .01 ], critical lures (CL) [t(15) = -3.87, p< .01], related words not presented (RnP) [t(15) = -3.02, p< .01] and not Related not Presented words (nRnP) [t(15) = -2.63, p< .05]. Participants produced more hits when had to recall words presented in each list, and less false memory, both critical (CL) and not critical (RnP and nRnP). We measured this recall effect for each list subtracting the recognition mean proportion in “after mathematics condition” from the “after recall condition” (see ). The list associate to the critical lure *caja* is the list with the highest difference in hits mean proportion, the lists *horror* and *canción* have the lowest difference. Instead the list *bottella* is the one with the highest difference in critical recognition, the list *arma* has the lowest difference.

Finally we computed the recognition of each list asking to 15 people to found the critical lure after they read each list. We didn’t find any relation between the recognition of list and the performance of participants ().

|  |  |
| --- | --- |
| List | Recognition |
| PERRO | 0,75 |
| FLOR | 0,00 |
| LIBRO | 1,00 |
| OJO | 0,67 |
| CÁRCEL | 0,67 |
| FIESTA | 0,83 |
| AVIÓN | 0,92 |
| GATO | 0,42 |
| ARMA | 0,42 |
| CAJA | 1,00 |
| CANCIÓN | 0,92 |
| BESO | 1,00 |
| LÁMPARA | 0,08 |
| BOTELLA | 0,50 |
| HORROR | 0,50 |
| CORONA | 1,00 |
| media | **0,67** |
| ds | **0,32** |

Table 4. Recognition of critical lure of 16 DRM lists

**Future collaboration with host institution**

The global purpose of this project was to initiate collaborative research in order to create two useful tools for researchers: *International Association Norms Database* (IAND) and the *DRM International Database* (DID) in which researchers could find data about Association Norms and DRM lists in several European languages.

A further purpose will be produce an equivalent number of Association Norms in Italian (about 300) with respect to Spanish and English (more than 5000)

Subsequently we could create Italian DRM list considering Associative Strengths (Forward, Backward and Inter-item) that could be compared to DRM list in other languages and when the number of these lists will be sufficient we could create the DID.

**Projected articles to result from the grant**

The aim is to write articles resulting from our work. We will acknowledge ESF in all future hopeful publications resulting from the grantee’s work in relation with the grant.

**References**

Alonso, M. A., Fernández, A., Díez, E., & Beato, M. (2004). Indices de producción de falso recuerdo y falso reconocimiento para 55 listas de palabras en castellano. *Psicothema, 16* , 357-362.

Fernández, A., Diez, E., & Alonso, M. A. (2004). Materiales Normativos en Castellano: Normas de Asociación Libre y Normas de Falso Recuerdo y Falso . *Página Web del Grupo de Investigaciones Cognitivas de la* , http://campus.usal.es/~gimc/nipe/.

**Appendix 1**

**Words used as cue in on-line discrete free association task.**

|  |  |
| --- | --- |
| 1 | AIRE |
| 2 | ALIANZA |
| 3 | ARMA |
| 4 | AROMA |
| 5 | ASESINAR |
| 6 | AVIÓN |
| 7 | BAÑERA |
| 8 | BESO |
| 9 | BODA |
| 10 | BOTELLA |
| 11 | CAJA |
| 12 | CANCIÓN |
| 13 | CÁRCEL |
| 14 | CASAR |
| 15 | CATARRO |
| 16 | CINE |
| 17 | CODO |
| 18 | COMPROMISO |
| 19 | CONSTIPADO |
| 20 | CONTENTO |
| 21 | CORAZÓN |
| 22 | CORBATA |
| 23 | CORONA |
| 24 | CORONEL |
| 25 | COSER |
| 26 | COSTURA |
| 27 | CRIMEN |
| 28 | CRIMINAL |
| 29 | CUARTEL |
| 30 | CULPA |
| 31 | CULPABLE |
| 32 | CURA |
| 33 | DEMONIO |
| 34 | DEPRIMIDO |
| 35 | DESCANSAR |
| 36 | DESCANSO |
| 37 | DESCOSIDO |
| 38 | DIABLO |
| 39 | DISCOTECA |
| 40 | DISPARO |
| 41 | ENTIERRO |
| 42 | ESENCIA |
| 43 | FIESTA |
| 44 | FLOR |
| 45 | FRESA |
| 46 | GAFAS |
| 47 | GATO |
| 48 | GENERAL |
| 49 | GUERRA |
| 50 | GUITARRA |
| 51 | HAMBRE |
| 52 | HIGIENE |
| 53 | HOMBRE |
| 54 | HORROR |
| 55 | HUMO |
| 56 | IGLESIA |
| 57 | INFIERNO |
| 58 | JIRAFA |
| 59 | LÁMPARA |
| 60 | LESIÓN |
| 61 | LIBRO |
| 62 | LLAVE |
| 63 | LLORAR |
| 64 | LUGAR |
| 65 | LUNA |
| 66 | MANO |
| 67 | MARIPOSA |
| 68 | MESA |
| 69 | MISA |
| 70 | MONTE |
| 71 | NARIZ |
| 72 | NOCHE |
| 73 | NOVIOS |
| 74 | OCULAR |
| 75 | OJO |
| 76 | OLOR |
| 77 | ÓPTICA |
| 78 | PEINE |
| 79 | PERRO |
| 80 | PINGÜINO |
| 81 | PLANCHA |
| 82 | PLAYA |
| 83 | PRADO |
| 84 | PRISIÓN |
| 85 | REJAS |
| 86 | RESFRIADO |
| 87 | REZAR |
| 88 | RISA |
| 89 | ROSA |
| 90 | SILLA |
| 91 | TELÉFONO |
| 92 | TENEDOR |
| 93 | TOBILLO |
| 94 | TROFEO |
| 95 | VACA |
| 96 | VELOCIDAD |
| 97 | VELOZ |
| 98 | VENCEDOR |
| 99 | VIAJE |
| 100 | ZAPATO |

**Appendix 2**

**Spanish DRM lists produced considering Backward Associative Strength (BAS). Words in lists are in decreasing order of BAS.**

|  |  |  |
| --- | --- | --- |
|  | CL | Lists |
| 1 | PERRO | LADRAR |
|  |  | BOZAL |
|  |  | CHUCHO |
|  |  | CAN |
|  |  | LADRIDO |
|  |  | CORREA |
|  |  | GALGO |
|  |  | MASCOTA |
|  |  | PULGAS |
|  |  | CACHORRO |
|  |  | RABO |
|  |  | ANIMAL |
| 2 | FLOR | GLADIOLO |
|  |  | PETUNIA |
|  |  | PÉTALO |
|  |  | LIRIO |
|  |  | MARGARITA |
|  |  | CAPULLO |
|  |  | AMAPOLA |
|  |  | CLAVEL |
|  |  | JAZMÍN |
|  |  | TULIPÁN |
|  |  | POLEN |
|  |  | PÉTALOS |
| 3 | LIBRO | EDICIÓN |
|  |  | CAPÍTULO |
|  |  | LECTURA |
|  |  | LECTOR |
|  |  | LEER |
|  |  | PRÓLOGO |
|  |  | AUTOR |
|  |  | EPÍLOGO |
|  |  | TOMO |
|  |  | PÁGINA |
|  |  | MANUAL |
|  |  | BIBLIOTECA |
| 4 | OJO | GUIÑO |
|  |  | PÁRPADO |
|  |  | OCULAR |
|  |  | PUPILA |
|  |  | IRIS |
|  |  | PESTAÑA |
|  |  | LACRIMAL |
|  |  | PARCHE |
|  |  | LÁGRIMA |
|  |  | OCULISTA |
|  |  | VISTA |
|  |  | CEJA |
| 5 | CÁRCEL | REJAS |
|  |  | PRISIONERO |
|  |  | BARROTES |
|  |  | PRESIDIO |
|  |  | PRESO |
|  |  | PRISIÓN |
|  |  | CONDENA |
|  |  | PENAL |
|  |  | CELDA |
|  |  | REJA |
|  |  | CRIMINAL |
|  |  | MAZMORRA |
| 6 | FIESTA | CONFETIS |
|  |  | GUATEQUE |
|  |  | NOCHEVIEJA |
|  |  | VERBENA |
|  |  | FIN DE AÑO |
|  |  | CELEBRACIÓN |
|  |  | JUERGA |
|  |  | SÁBADO |
|  |  | INVITACIÓN |
|  |  | CUBATA |
|  |  | DIVERSIÓN |
|  |  | ESMOQUIN |
| 7 | AVIÓN | PILOTO |
|  |  | AEROPUERTO |
|  |  | AZAFATA |
|  |  | AEROPLANO |
|  |  | PASAJERO |
|  |  | VUELO |
|  |  | HÉLICE |
|  |  | VUELA |
|  |  | AVIACIÓN |
|  |  | VIAJE |
|  |  | VOLAR |
|  |  | VIAJAR |
| 8 | GATO | MAULLIDO |
|  |  | MAULLAR |
|  |  | FELINO |
|  |  | CASCABEL |
|  |  | ARAÑAZO |
|  |  | PERSA |
|  |  | ANGORA |
|  |  | PARDO |
|  |  | BIGOTES |
|  |  | RATÓN |
|  |  | CURIOSIDAD |
|  |  | LINCE |
| 9 | ARMA | RIFLE |
|  |  | FUSIL |
|  |  | METRALLETA |
|  |  | LETAL |
|  |  | ESCOPETA |
|  |  | MUNICIÓN |
|  |  | PUÑAL |
|  |  | ATRACO |
|  |  | BALA |
|  |  | DISPARO |
|  |  | MISIL |
|  |  | PISTOLA |
| 10 | CAJA | PANDORA |
|  |  | CARTÓN |
|  |  | HERRAMIENTAS |
|  |  | BANCO |
|  |  | BLINDADA |
|  |  | CUADRADA |
|  |  | PAQUETE |
|  |  | CAJÓN |
|  |  | ALMACÉN |
|  |  | BOTE |
|  |  | VACÍA |
|  |  | FRÁGIL |
| 11 | CANCIÓN | MELODÍA |
|  |  | SONATA |
|  |  | NANA |
|  |  | CANTO |
|  |  | CORO |
|  |  | CANTAR |
|  |  | MELODÍAS |
|  |  | MENTIROSA |
|  |  | VERSIÓN |
|  |  | HIMNO |
|  |  | FESTIVAL |
|  |  | TONADA |
| 12 | BESO | LABIOS |
|  |  | MEJILLA |
|  |  | LABIO |
|  |  | BOCA |
|  |  | SALIVA |
|  |  | ABRAZO |
|  |  | MOFLETE |
|  |  | CARIÑO |
|  |  | ÍNTIMO |
|  |  | CARICIA |
|  |  | CUELLO |
|  |  | AFECTO |
| 13 | LÁMPARA | ALADINO |
|  |  | GENIO |
|  |  | MESILLA |
|  |  | FLEXO |
|  |  | LUMINOSIDAD |
|  |  | MESITA |
|  |  | ALUMBRAR |
|  |  | LUMINOSO |
|  |  | LUZ |
|  |  | BOMBILLA |
|  |  | TECHO |
|  |  | CANDIL |
| 14 | BOTELLA | TAPÓN |
|  |  | CORCHO |
|  |  | VIDRIO |
|  |  | PLÁSTICO |
|  |  | MENSAJE |
|  |  | ALCOHÓLICO |
|  |  | ALCOHÓLICA |
|  |  | VIDRIERA |
|  |  | ALCOHOL |
|  |  | BORRACHERA |
|  |  | LITRO |
|  |  | CRISTAL |
| 15 | HORROR | ESPANTO |
|  |  | TERRIBLE |
|  |  | FATALIDAD |
|  |  | PAVOR |
|  |  | CATÁSTROFE |
|  |  | ATROCIDAD |
|  |  | TERROR |
|  |  | MIEDO |
|  |  | PÁNICO |
|  |  | BARBARIDAD |
|  |  | PESADILLA |
|  |  | GRITOS |
| 16 | CORONA | REY |
|  |  | REINADO |
|  |  | REINA |
|  |  | MAJESTAD |
|  |  | PRINCESA |
|  |  | REAL |
|  |  | REINO |
|  |  | REYES |
|  |  | EMPERADOR |
|  |  | MONARQUÍA |
|  |  | ADORNO |
|  |  | VIRREY |