Database of Semantically Associated and Unassociated Pairs of Everyday Objects for the Study of Memory in Children: Technical Report

Martina Becker, Kerstin Kipp, & Axel Mecklinger

Experimental Neuropsychology Unit, Department of Psychology,
Saarland University, Saarbrücken, Germany

Address correspondence to:

Martina Becker

Experimental Neuropsychology Unit

Department of Psychology

Saarland University

D-66123 Saarbrücken, Germany

Phone: ++49-(0)681-302-58095

Email: mk.becker@mx.uni-saarland.de

June, 05, 2009

Abstract

The present study aimed at creating a database of standardized pairs of semantically associated and unassociated everyday objects for the use in research in experimental developmental psychology. We had a large sample of 289 German school-aged children rate a set of 300 single objects, 150 semantically related, and 150 unrelated pairs. In a first step, the participants had to name the presented single objects to indicate the experienced level of familiarity for each item. The second part of the study focused on the rating of association strength of the pairs of objects. Here, we used a three-point rating scale to have the participants decide on the magnitude of semantic relatedness. For each single object, a familiarity score and a naming agreement ratio were calculated to quantify the degree of the children's conceptual knowledge and familiarity with the selected objects. The relatedness scores computed for the pairs of objects can be used to divide the pairs into separate categories according to the strength semantic association. These rating procedures yielded a large and well controlled database of modern pictorial material for experimenters to choose from. It may be helpful for designing experiments in developmental psychology research with clinical and non-clinical populations.

1 Introduction

The study of the developing brain and memory is one of the most intriguing fields of developmental neuropsychology. But, as experimental research with children differs in many ways from the study of adolescent and adult participants, the developmental researcher is challenged even more to come up with innovative methods, techniques and materials to obtain reliable results. One significant disadvantage of the younger participants against the older population apparently is their insufficient vocabulary and reading capability. That is one persuasive argument why pictorial stimuli are especially suitable for the use with young samples when it comes to the study of memory in children. Another important feature of pictorial stimuli is that items are much more likely to be remembered if they are shown as pictures, not words. This phenomenon is also known as the picture superiority effect. Thus, children can benefit to a large extent from the use of pictures over words as stimulation material, resulting in higher memory performance, good compliance and better decision confidence while performing the relevant tasks.

Pictures have already been used successfully to examine a wide range of memory phenomena in childhood, especially in the domains of implicit and explicit long-term memory. The suitability of pictorial stimuli for studies with children has been proven for a variety of memory-related tasks and paradigms, e.g. perceptual priming (Parkin & Streete, 1988; Badgayian, 2000; Cycowicz, Friedman, Snodgrass, Rothstein, 2000), paired-associate learning (e.g. the early work of Dilley & Paivio, 1968), continuous recognition (e.g. Czernochowski, Mecklinger, & Johansson, 2009), or item and source recognition (Czernochowski, Mecklinger, Johansson, & Brinkmann, 2005; Czernochowski, Brinkmann, Mecklinger, & Johansson, 2004; see also Berman, Friedman, & Cramer, 1990; Billingsley, Smith, & McAndrews, 2002; Cycowicz, Friedman, & Duff, 2003; Cycowicz, Friedman, Duff, & Snodgrass, 2001; Marshall, Drummey, Fox, Newcombe, 2002; Mitchell, 1993).

To date, the researcher can resort to a growing number of standardized databases consisting of up to 400 pictures and evaluated according to various criteria such as name agreement, familiarity, visual complexity, image agreement, age of acquisition and naming latencies. In 1980, Snodgrass & Vanderwart were the first to publish picture norms for name agreement, familiarity and complexity for a set of 260 pictures. The participants in this rating study were young English-speaking adults. This pioneering early work paved the way for associated publications of enhanced standardized picture databases in 1985 (Berman, Friedman, Hamberger, & Snodgrass; rated by 5- to 6-year-old children) and 1997 (Cycowicz, Friedman, Rothstein, & Snodgrass; rated by 8- to 10-year-old children). These norming studies for the American English-speaking areas

were soon followed by the assessment of European picture norms for British (Barry, Morrison, & Ellis, 1997), Spanish (Sanfeliu & Fernández, 1996), Italian (Dell'Acqua, Lotto, & Job, 2000), French (Alario & Ferrand, 1999; Bonin, Peereman, Malardier, Méot, & Chalard, 2003), Portuguese (Pompéia, Miranda, & Bueno, 2001), Dutch (Martein, 1995), as well as for Icelandic (Pind, Jónsdóttir, H., Gissurardóttir, H., & Jónsson, 2000), Japanese (Nishimoto, Miyawaki, Ueda, & Takahashi, 2005) and most recently for Modern Greek (Dimitropoulu, Duñabeitia, Blitsas, & Carreiras, 2009).

To our knowledge, there is no such standardized database of pictorial stimuli appropriate for German-speaking countries, neither rated by adults nor by children. Our aim was to create a new German database that consists of high resolution photographs of modern everyday objects and is suitable for the use with school-aged children. Hereby, we sought to provide the experimenter with standardized material that renders the application of idiosyncratic selection criteria unnecessary and assists with a multitude of experimental purposes during research on cognitive and memory development.

2 Rating Study

Our rating study aimed at 1) selecting a pool of everyday objects that children of early school-age are highly familiar with and 2) at providing a standardized set of pairs of common objects for the use in experimental psychology research. Accordingly, the first part of the rating study was designated to assess the children's semantic knowledge and their linguistic proficiency for the selected items, respectively. Thereby, we sought to exclude any objects in the first place that were predominantly rated as unfamiliar or could not be named and identified correctly by the majority of participants. In a second step, we used a three-tier rating scale to have the participants decide to what extent the pairs of objects were semantically related. Thus, we were able to differentiate precisely between strongly and weakly related pairs, and to identify those items that did not fall explicitly in any of the before-mentioned categories.

2.1 Participants

A total of 289 pupils from four local elementary schools participated in our rating study. 141 of the children were third-graders, 148 were in fourth grade. The mean age was 9;6 years, ranging from 7;11 to 12;0 years. The details of the involved elementary schools and participants are displayed in Table 1.

Table 1: Elementary schools and participants

Elementary school (Location)	**Total number of participants** (mean age)	**Third-graders** (mean age/range)	**Fourth-graders** (mean age/ range)
Albert-Schweitzer-Schule (Dudweiler)	73 (9;6)	42 (9;0/7;11-9;8)	31 (10;3/9;5-11;6)
Mellinschule/Pestalozzi-Schule (Sulzbach)	118 (9;8)	51 (9;2/7;11-11;3)	67 (10;0/9;3-11;4)
Offene Ganztagsgrundschule Weyersberg (Saarbrücken)	12 (9;6)	5 (8;11/8;8-9;2)	7 (10;1/9;7-10;5)
Turmschule (Dudweiler)	86 (9;9)	42 (9;2/8;2-10;9)	44 (10;4/9;5-12;0)

Due to privacy policies applying to the assessment of data in German public institutions, personal information of the participants including name, gender or nationality were not acquired. The Saarland Ministry of Education, Families, Women and Culture and the local headmasters gave their permission to the conduction of the rating study before the pupil's parents were informed in writing. Only those children whose parents had signed an informed consent form took part in this survey. The participants did not receive any financial reward, but they were given a small prize (sweets and chocolates) afterwards. One participant did not finish the rating procedure, and therefore we excluded this data from further analyses.

2.2 Materials

The initial pool of 300 photographs of everyday objects was taken from the royalty-free digital image collection "PhotoObjects Deluxe", published by Hemera Technologies Inc. The objects stemmed from various categories such as musical instruments, tools, food, clothing, household appliances, sports equipment, furniture, animals and plants (see Appendix A for a detailed list). At first, these 300 items were pre-experimentally combined into 150 strongly semantically related pairs. We then rearranged these pairs to obtain 150 semantically unrelated pairs. In order to reduce the time required to conduct the whole rating procedure to 60 minutes, the original set was divided into three subsets (A, B, C) of 100 single objects (naming) and 100 pairs of objects (rating of association strength) each. For each participant, every object appeared only once.

2.3 Procedure

The rating study was carried out on location in rooms provided by the participating schools. To ensure that the ongoing lessons were not disturbed, the headmasters themselves assigned the children to groups and scheduled the sessions (see Table 2). Each session was supervised by at least one teacher who supported the experimenter in instructing the participants and carrying out the rating. Depending on the size and equipment of the rooms provided by the schools, the samples consisted of 12 to 41 pupils. To familiarize the participants with the rating procedure and the handling of the questionnaire, the experimenter introduced exercise examples on screen explaining the details of the questionnaire and the timing of the object presentations. The single objects and pairs were projected consecutively onto a portable projection screen (200 x 150 cm) that was placed in front of the blackboard, or onto the front wall of the room. The following sections explain the further details of the procedures implemented for the naming and rating part of the study.

Table 2: Assignment of participants to three subsets of stimuli

Subset	Total number of participants (mean age)	Third-graders (mean age)	Fourth-graders (mean age)
Set A	108 (9;5)	70 (9;0)	38 (10;1)
Set B	88 (9;8)	40 (9;1)	48 (10;1)
Set C	93 (9;11)	30 (9;2)	63 (10;3)

2.3.1 Naming

Every single object was presented against a white background for 12 seconds. The order of appearance was pseudo-randomized to avoid the immediate succession of two pre-experimentally strongly associated objects. The participants were asked to write down the name of the displayed object while the image was visible on screen (see Appendix D for the questionnaire). They were instructed to leave the field blank if they could not recognize the object or were unable to give any appropriate name. In order to increase the motivation of the participants in naming as many objects as possible, the experimenter encouraged the children to write any name down even if they did not know how to spell the term correctly. After presentation of the first 50 of the total set of 100 items, a five-minute break was given, followed by the presentation of the remaining 50 items. The whole procedure lasted about 35 minutes. This familiarity rating was followed by the rating of association strength procedure (after a ten-minute recess) which is described in the following section.

2.3.2 Rating of Association Strength

The 100 pairs of objects were displayed consecutively against a white background and remained visible for 12 seconds. We used a pseudo-randomized presentation sequence that allowed not more than four consecutive presentations of pairs with the same pre-experimentally defined semantic relationship. During that period of presentation, the participants had to decide whether the items were associated strongly, moderately or weakly on the semantic level. They had to indicate their judgment by checking the box next to the corresponding smiley figure (see Appendix E for the rating form). While the experimenter was giving the instructions for the rating of association strength, the children could follow what was said by reading the printed directions on their rating sheets. They were told that, in context of our rating study, things matched well when the pair fulfilled at least one of the following criteria: 1) The two things can often be seen together at one place (here, the example of “taxi” and “taxi driver” was given), 2) they

often come to mind simultaneously when one is thinking of one of the objects (example: “winter” and “cold”), 3) they share some characteristic features (example: “apple” and “pear”, both being fruit and edible), or 4) they can be used together (example: “stamp” and “envelope”). Afterwards, the children were given two examples that all participants in one group were to answer together (first example: “lamp” and “light bulb”; second example: “bicycle” and “tea cup”). The corresponding smiley figures were introduced as follows: 1) The smiling face should be checked if one thinks that the two objects match very well, 2) the undecided/straight face is to be chosen if one feels that the objects fit only moderately, 3) whereas the frowning face should indicate that in the participant’s opinion, both objects do not match at all. None of the elements of a pair that had appeared in the naming part of the study was presented for a second time here. A short break of 5 minutes was introduced after presentation of the first half of pairs. The whole procedure lasted about 25 minutes.

2.4 Data analysis

2.4.1 Naming

We defined two different measures to quantify the level of conceptual knowledge and the overall naming agreement. Firstly, a *familiarity score* was calculated that took into account the degree of familiarity of a given object, as reflected in the accuracy of naming and spelling. Secondly, the proportion of correct responses was set in relation to the total number of responses given, resulting in the *naming agreement ratio*. Thereby, we defined a measure that indicated to what extent the participants *generally* agreed on an object’s denotation. To compute the familiarity score, a digit ranging from 0 to 3 was assigned to every written response. The highest value 3 was given to entries that specified and spelled the concept correctly. Responses that described the accurate concept but contained misspellings were assigned 2 points, while items that did not mention the correct term but gave an alternative concept that clearly was semantically related to the proper concept were scored with 1 point. Missing or incoherent entries received the value 0. Thus, the familiarity score yielded values ranging from 0 to 3, whereby 3 indicated the highest possible naming accuracy. The naming agreement ratio was calculated by dividing the frequency of correct responses (accurate naming of the concept, including those responses containing spelling errors) by the frequency of all given responses, thus yielding a measure that reflects the degree of agreement on a certain concept across all participants.

2.4.2 Rating of Association Strength

We used a three-point analog rating scale to quantify the strength of the semantic association between the pairwise presented everyday objects. As mentioned before, the participants checked the boxes beyond the smiling face, the undecided/straight face or the frowning face to indicate their decision concerning the semantic relationship of the objects. To evaluate these responses, we assigned digits from 0 to 3 to each item. Responses that indicated a strong relation of the paired items (smiling face) received a score of 3 points, moderately linked pairs (undecided/straight face) were scored with 2 points and pairs that were rated as weakly connected (frowning face) were given 1 point. Missing entries received a score of 0. The relatedness score could range from 0 (total ambiguity or indistinctness) to 3 (strongest possible semantic association).

2.5 Results

2.5.1 Naming

2.5.1.1 Familiarity Score

The obtained familiarity scores and standard deviations for each single object can be found in Appendix B. T-tests confirmed that the three subsets of items did not differ with respect to the average familiarity score; therefore we analyzed the data collapsed across all subsets. The overall mean familiarity score was 2.24 (SD = .57), ranging from .23 to 3.00. On the whole, 262 out of the total of 300 objects achieved at least 50 percent of the maximum score (90 items in subset A, 83 in subset B, 89 in subset C).

To evaluate age-related differences in vocabulary and orthographic knowledge of the participants, we additionally examined the individual achievement of the participants in naming. As each subset contained 100 items, the maximum naming score a participant could reach was 300 points, provided that he always gave the correct name and did not produce any spelling errors when writing the term down. Table 3 shows the results of that subject-based analysis of naming performance. As the subsets differed in terms of the number of third- and fourth-graders assigned to the rater samples, we report the data separately for each subset. The participants who rated subset A scored highest with 230 of 300 points, followed by the raters of subset C with 224 points and subset B with 217 points. One-tailed t-tests confirmed this rank order with $p < .05$ for every calculated contrast. The third-graders performed worse than the older fourth-graders only in subset C with 212 versus 230 points. Nevertheless, the mean familiarity scores did not significantly correlate with age, as shown above (all $p > .05$).

Table 3: Subject-based familiarity scores for each subset

Subset	Measure	Overall	Third-graders	Fourth-graders
A	Mean (SD)	230 (28)	225 (25)	240 (30)
	Range		136-261	154- 275
	Correlation with age *r*	.10		
B	Mean (SD)	217 (22)	215 (20)	220 (23)
	Range		139-258	128-259
	Correlation with age *r*	.07		
C	Mean (SD)	224** (25)	212 (25)	230 (23)
	Range		148-262	153-264
	Correlation with age *r*	.06		

Note

** indicates that third- and fourth-graders differed in the mean subject-based familiarity score with $p < .01$.

2.5.1.2 Naming agreement ratio

The naming agreement ratios corresponding to every object can be found in Appendix B. As confirmed by t-tests, the mean naming agreement ratio did not differ among the three subsets. Consequently, we analyzed the naming agreement ratio collapsed across all three subsets. The mean naming agreement ratio we observed was 83.72 percent (SD = 20.73) and ranged from 1.15 to 100 percent. The number of objects that were given a naming agreement ratio below 50 percent was low with 32 out of 300 objects (10 items subset A, 12 in subset B, and 10 objects in subset C).

2.5.2 Rating of Association Strength

Appendix C lists the relatedness scores and corresponding standard deviations for all presented pairs of objects. Again, we did not find statistically significant differences between the relatedness scores obtained for the three subsets. Accordingly, we analyzed the data collapsed across all 300 pairs. The mean relatedness score was 1.90 (SD = .87), with a minimum value of .96 and a maximum of 3.00.

Table 4: Relative proportion of pairs assigned to the three response categories in the rating of association strength

Association strength	**Relative proportion (%)**	
	Third-graders	Fourth-graders
Strong	43.60	43.30
Moderate	5.72	5.82
Weak	49.34	49.90

As illustrated in Table 4, the assignment of pairs to the three response categories (strongly, moderately and weakly associated pairs) did not differ between third- and fourth-graders.

3 Discussion

In this rating study, we pursued the goal of providing a standardized database of pictorial stimuli for experimental developmental psychology research with children of early school age. The naming part of the study was designated to assess the degree of familiarity for the everyday objects, as well as the children's vocabulary, orthographic and concept knowledge related to the presented items. Item-based analyses showed that the vast majority of items was well-known among the participants, as 87.33 percent of all items received a mean familiarity score of 50 percent of the maximum score, or even higher.

To further examine the concept and language knowledge of the participants, we also performed subject-based analyses that yielded considerable results: The three subsets revealed substantial variations among the corresponding raters, as the raters of subset A scored significantly higher than the raters of subset B, and C. We can only suggest that these disparities in performance might be accounted for by varying educational or social environments among the participating schools. Even though in subset C the third-graders performed substantially worse than the older fourth-graders, the mean familiarity scores did not correlate with age. Thus, the age-related difference in set C might result from the fact that the fourth-graders that rated subset C proved to be the oldest sample among all participants. Probably this higher age and their distinct life and learning experience contributed to the observed divergences. The results we obtained by analyzing the naming agreement ratio support the view that we succeeded in collecting a sample of highly familiar everyday objects, as the mean naming agreement ratio was as high as 83.72 percent. Only the names of 32 out of all 300 rated objects were not agreed on by the majority of participants.

A second aim of our rating study was to select pairs of objects that can be categorized according to the strength of semantic association. Our selection of pairs covers a broad range from clearly non-associated to strongly semantically associated objects. Notably, the third- and fourth-graders showed a comparable rating behavior and did not differ with respect to the distributions of relatedness scores they assigned to the pairs of objects.

In conclusion, we were able to develop a large and internally consistent database of pictorial material that was standardized in terms of familiarity, naming agreement and association strength. Of course, the researcher is invited to set his or her own criteria according to the conditions needed for the intended experiments. Future directions might consider the re-evaluation and extension of this picture database with respect to common measures such as image agreement, visual complexity, naming latencies or age of

acquisition, which could not be assessed during the present study. Additionally, the extension of the studied age range to older children, adolescents and adults would highly increase the applicability and usefulness of our database, making it even more suitable for a wide range of experimental purposes.

4 Acknowledgements

We were able to conduct this extensive study with kind permission of the Saarland ministry of education, families, women and culture. We would like to thank the local headmasters of all schools and the parents and pupils that took part in this study. We also are grateful for the support of Maria Bunge, Julia Selzner, Martina Hubo, and Michael Hoppstädter with data acquisition and evaluation.

5 References

Alario, F.-Xavier, & Ferrand, Ludovic (1999). A set of 400 pictures standardized for French: Norms for name agreement, image agreement, familiarity, visual complexity, image variability, and age of acquisition. *Behavior Research Methods, Instruments, & Computers, 31 (3),* 531-552.

Badgaiyan, R.D. (2000). Neuroanatomical organization of perceptual memory: An fMRI study of picture priming. *Human Brain Mapping, 10,* 197-203.

Barry, C., Morrison, C.M., & Ellis, A.W. (1997). Naming the Snodgrass and Vanderwart pictures: effects of age of acquisition, frequency, and name agreement. *The Quarterly Journal of Experimental Psychology Section A, 50 (3),* 560-585.

Berman, S., Friedman, D. & Cramer, M. (1990). A developmental study of event-related potentials during explicit and implicit memory. *International Journal of Psychophysiology, 10 (2),* 191-197.

Berman, S., Friedman, D., Hamberger, M., & Snodgrass, J. G. (1989). Developmental picture norms: Relationships between name agreement, familiarity, and visual complexity for child and adult ratings of two sets of line drawings. *Behavior Research Methods, Instruments,& Computers, 21*, 371-382.

Billingsley, R.L., Smith, M.L. & McAndrews, M.P. (2002). Developmental patterns in priming and familiarity in explicit recollection. *Journal of Experimental Child Psychology, 82,* 251-277.

Bonin, P., Peereman, R., Malardier, N., Méot, A., & Chalard, M. (2003). A new set of 299 pictures for psycholinguistic studies: French norms for name agreement, image agreement, conceptual familiarity, visual complexity, image variability, age of acquisition, and naming latencies. *Behavior Research Methods, 35,* 158-167.

Cycowicz, Y. M., Friedman, D., & Duff, M. (2003). Pictures and their colors: What do children remember? *Journal of Cognitive Neuroscience, 15,* 759-768.

Cycowicz, Y. M., Friedman, D., Duff, M., & Snodgrass, J. G. (2001). Recognition and source memory for pictures in children and adults. *Neuropsychologia, 39,* 255-267.

Cycowicz, Y. M., Friedman, D., Rothstein, M., & Snodgrass, J. G. (1997). Picture naming by young children: Norms for name agreement, familiarity, and visual complexity. *Journal of Experimental Child Psychology, 65,* 171-237.

Cycowicz, Y.M., Friedman, D., Snodgrass, J.G., Rothstein, M. (2000). A developmental trajectory in implicit memory is revealed by picture fragment completion. *Memory, 8 (1),* 19-35.

Czernochowski, D., Brinkmann, M., Mecklinger, A., & Johansson, M. (2004). When binding matters: An ERP analysis of the development of recollection and familiarity. In A. Mecklinger, H. Zimmer, & U. Lindenberger (Eds.), *Bound in memory: Insights from behavioral and neuropsychological studies* (pp. 93-128). Aachen: Shaker.

Czernochowski, D., Mecklinger, A., & Johansson, M. (2009). Age-related changes in the control of episodic retrieval: an ERP study of recognition memory in children and adults. *Developmental Science [On-line serial]*. Available: DOI 10.1111/j.1467-7687.2009.00841.x.

Czernochowski, D., Mecklinger, A., Johansson, M., & Brinkmann, M. (2005). Age-realted differences in familiarity and recollection: ERP evidence from a recognition memory study in children and young adults. *Cognitive, Affective, & Behavioral Neuroscience, 2005, 5 (4),* 417-433.

Dilley, M.G., & Paivio, A. (1968). Pictures and words as stimulus and response items in paired-associate learning of young children. *Journal of Experimental Child Psychology, 6 (2),* 231-240.

Dimitropoulu, M., Duñabeitia, J.A., Blitsas, P., & Carreiras, M. (2009). A standardized set of 260 pictures for Modern Greek: Norms for name agreement, age of acquisition, and visual complexity. *Behavior Research Methods, 41,* 584-589.

Marshall, D.H., Drummey, A.B., Fox, N.A., Newcombe, N.S. (2002). An event-related potential study of item recognition memory in children and adults. *Journal of Cognition and Development, 3 (2),* 201-224.

Martein, R. (1995). Norms for name and concept agreement, familiarity, visual complexity and image agreement on a set of 216 pictures. *Psychologica Belgica, 35,* 205-225.

Mitchell, D.B. (1993). Implicit and Explicit Memory for Pictures: Multiple Views across the Lifespan. In P. Graf & M.E.J. Masson (Hrsg.). *Implicit Memory. New Directions in Cognition, Development and Neuropsychology* (pp. 171-190). Hillsdale: Lawrence Erlbaum Associates.

Parkin, A.J. & Streete, S. (1988). Implicit and explicit memory in young children and adults. *British Journal of Psychology, 79,* 361-369.

Pind, J., Jónsdóttir, H., Gissurardóttir, H., & Jónsson, F. (2000). Icelandic norms for the Snodgrass and Vanderwart (1980) pictures: name and image agreement, familiarity, and age of acquisition. *Scandinavian Journal of Psychology, 41 (1),* 41-48.

Pompéia, S., Miranda, M.C., Bueno, O.F.A. (2001). A set of 400 pictures standardised for Portueguese. *Arquivos de Neuro-Psiquiatria, 59 (2-B),* 330-337.

Sanfeliu, M. C., & Fernández, A. (1996). A set of 254 Snodgrass–Vanderwart pictures standardized for Spanish: Norms for name agreement, image agreement, familiarity, and visual complexity. *Behavior Research Methods, Instruments, & Computers*, *28,* 537-555.

Dell'Acqua, R., Lotto, L., Job, R. (2000). Naming times and standardized norms for the Italian PD/DPSS set of 266 pictures: Direct comparisons with American, English, French, and Spanish published databases. *Behavior Research Methods, Instruments, & Computers*, *32*, 588-615.

Nishimoto, T., Miyawaki, K., Ueda, T., Une, Y., Takahashi, M. (2005). Japanese normative set of 359 pictures. *Behavior Research Methods, 37,* 398-416.

Snodgrass, J. G., & Vanderwart, M. (1980). A standardized set of 260 pictures: Norms for name agreement, image agreement, familiarity, and visual complexity. *Journal of Experimental Psychology: Human Learning and Memory, 6,* 174-215.

Appendix A: Alphabetical List of Objects

Affe

Ampel

Ananas

Angelhaken

Anker

Anrichte

Aquarium

Aschenbecher

Auto

Baby

Backformen

Badewanne

Baguette

Ballerina

Ballettschuhe

Banane

Bär

Basketball

Basketballkorb

Batterie

Bauklötze

Baumstamm

Besen

Bierflasche

Bierglas

Bleistift

Blume

Blumenstrauß

Blumentopf

Bogen

Bowlingkugel

Bügelbrett

Bügeleisen

Bürste

Cappuccino

CD

CD-Hülle

Chips

Christbaum

Clown

Computermaus

Cornflakes

Croissant

Dartpfeil

Dartscheibe

Discman

Dosenöffner

Dosentomaten

Dromedar

Ehepaar

Ehering

Ei

Eichhörnchen

Einkaufstüte

Einkaufswagen

Eisbär

Eisportionierer

Eiswaffel

Elefant

Ente

Fahrrad

Fahrradhelm

Farbtöpfe

Fernbedienung

Fernseher

Feuerlöscher

Feuerstelle

Feuerwehrauto

Fisch

Fledermaus

Flip-Flops

Flugzeug

Fön

Fußball

Fußballschuhe

Gabel

Garn

Gartentisch


Gebiss


Geburtstagstorte


Gehstock


Geige


Geigenkasten


Geldbeutel


Geldmünzen


Geldscheine


Geschenk


Geschenkband


Gießkanne


Glas Orangensaft


Glühbirne


Grabstein


Grashüpfer


Großeltern


Gummibärchen


Gummistiefel


Hamburger


Hammer


Hamster


Hamsterrad


Handrührgerät


Handtücher


Hase


Haselnuss


Hausschuhe


Hefter


Heißluftballon


Herd


Heuballen


Heugabel


Honigwaben


Hose


Hufeisen


Huhn


Hummel


Hund


Hundeleine


Jacke

Jesuskreuz

Kaffeemaschine

Kaffeetasse

Käfig

Kanu

Kartoffel

Käse

Katze

Kegel

Kerze

Kette

Kiwi

Kopfhörer

Korkenzieher

Krokodil

Krone

Kuchen

Kuh

Küken

Kürbis

Lampe

Laptop

Lautsprecher

Libelle

Lidschatten

Liegestuhl

Lineal

Lippenstift

Locher

Löffel

Löwe

Maus

Messer

Milch

Möhren

Mond

Möwe

Muffin

Müllsäcke

Mülltonne

Mütze

Nägel

Nähnadel

Noten

Nudelholz

Nussknacker

Ofenhandschuh

Orange

Osterglocke

Osterhase

Palme

Papagei

Paprika

Patrone

Pfanne

Pfannkuchen

Pfarrer

Pfeffermühle

Pfeil

Pferd

Pinguin

Pinsel

Pirat

Pistole

Pizza

Pizzaschneider

Pommes frites

Quietscheentchen

Radiergummi

Rakete

Raupe

Regal

Ring

Ritter

Ritterburg

Rose

Rucksack

Ruder

Rutsche

Säge

Salat

Salatschleuder

Salzstangen

Salzstreuer

Sandalen

Sandförmchen

Sarg

Saxofon

Schachbrett

Schachfigur

Schaf

Schal

Schälmesser

Schatztruhe

Schaukel

Schere

Schiff

Schildkröte

Schirm

Schlüssel

Schmetterling

Schnuller

Schokolade

Schokoladenei

Schraube

Schraubenzieher

Schubkarre

Schulbank

Schüssel

Seepferdchen

Seestern

Sektflasche

Sektglas

Sessel

Skier

Skischuhe

Sonnenbrille

Spaghetti

Sparschwein

Spaten

Spitzer

Spritze

Staubsauger

Stempel

Stempelkissen

Stereoanlage

Stethoskop

Stiftspäne


Strandspielzeug


Streichhölzer


Stricknadeln


Strohhut


Strumpf


Suppenteller


Tafel


Taschenlampe


Taucherbrille


Tauchflossen


Teekanne


Teetasse


Teig


Tennisball


Tennisschläger


Thron


Toast


Toaster


Toilette


Toilettenpapier


Topf


Tortenheber


Treppe


Trommel


Trompete


Tür


Turnschuhe


Vase


Videokassette


Videorekorder


Vorhängeschloss


Waffel


Waffeleisen


Walnuss


Wanderschuhe


Waschbecken


Wäschekorb


Waschmaschine

Wasserwaage


Weihnachtsmann

Weinflasche

Werkzeugkasten

Wolle

Wurm

Zahnbürste

Zange

Zelt

Zigarette

Zirkel

Zitrone

Zitruspresse

Zollstock

Zucchini

Zuckerspender

Appendix B: Familiarity Scores and Naming Agreement

No.	German Word	English Word	Familiarity Score		Naming Agreement
			Mean	*SD*	
1	Hund	Dog	3.00	0.00	100.00
2	Fisch	Fish	2.99	0.10	100.00
3	Tür	Door	2.98	0.15	100.00
4	Hase	Rabbit	2.97	0.18	100.00
5	Wurm	Worm	2.96	0.25	98.92
6	Kuh	Cow	2.95	0.27	98.92
7	Katze	Cat	2.95	0.23	100.00
8	Hose	Pants	2.94	0.36	99.07
9	Eiswaffel	Ice cream cone	2.94	0.25	100.00
10	Ampel	Traffic light	2.93	0.43	100.00
11	Messer	Knife	2.91	0.38	100.00
12	Flugzeug	Airplane	2.91	0.39	100.00
13	Fledermaus	Bat	2.91	0.29	100.00
14	Schirm	Umbrella	2.91	0.38	100.00
15	Auto	Car	2.91	0.44	97.20
16	Elefant	Elephant	2.91	0.38	100.00
17	Pferd	Horse	2.90	0.37	97.70
18	Pirat	Pirate	2.89	0.45	97.83
19	Zelt	Tent	2.89	0.39	100.00
20	Turnschuhe	Sneakers	2.89	0.37	98.15
21	Gabel	Fork	2.88	0.41	100.00
22	Lampe	Lamp	2.88	0.40	100.00
23	Strohhut	Straw hat	2.87	0.45	98.84
24	Banane	Banana	2.87	0.34	100.00
25	Paprika	Sweet pepper	2.87	0.48	100.00
26	Pinsel	Paint brush	2.86	0.44	100.00
27	Treppe	Stairway	2.86	0.37	99.07
28	Baby	Baby	2.85	0.51	99.06
29	Löwe	Lion	2.85	0.41	98.15

30	Bär	Bear	2.84	0.53	100.00
31	Stempel	Stamp	2.84	0.53	100.00
32	Kerze	Candle	2.83	0.38	100.00
33	Pinguin	Penguin	2.83	0.49	98.84
34	Computermaus	Mouse	2.83	0.63	97.62
35	Schokolade	Chocolate	2.82	0.38	100.00
36	Zitrone	Lemon	2.82	0.49	98.91
37	Seestern	Starfish	2.81	0.55	95.33
38	Schere	Scissors	2.81	0.47	100.00
39	Schlüssel	Key	2.81	0.52	100.00
40	Strumpf	Sock	2.80	0.49	99.07
41	Kette	Necklace	2.80	0.50	98.91
42	Hammer	Hammer	2.80	0.41	100.00
43	Eisbär	Polar bear	2.79	0.44	98.85
44	Rose	Rose	2.79	0.64	90.65
45	Ring	Ring	2.78	0.67	92.31
46	Topf	Pot	2.78	0.72	100.00
47	Spitzer	Pencil sharpener	2.78	0.56	100.00
48	Palme	Palm tree	2.78	0.71	97.59
49	Mütze	Cap	2.77	0.51	98.91
50	Nägel	Nails	2.76	0.54	94.62
51	Schaukel	Swing	2.76	0.43	100.00
52	Ente	Duck	2.76	0.71	95.19
53	Waffel	Waffle	2.76	0.68	97.12
54	Krone	Crown	2.76	0.72	100.00
55	Geschenk	Gift	2.76	0.59	95.35
56	Kanu	Canoe	2.75	0.57	96.26
57	Christbaum	Christmas tree	2.75	0.46	98.85
58	Fußball	Soccer ball	2.75	0.46	98.85
59	Säge	Saw	2.74	0.57	100.00
60	Noten	Notes	2.74	0.73	94.23
61	Clown	Clown	2.74	0.52	99.07
62	Jacke	Jacket	2.74	0.60	100.00
63	Taschenlampe	Flashlight	2.74	0.64	93.02
64	Pizza	Pizza	2.73	0.45	100.00

65	Fahrrad	Bicycle	2.72	0.45	100.00
66	Zirkel	Pair of compasses	2.72	0.77	100.00
67	Bauklötze	Building bricks	2.71	0.72	98.06
68	Ei	Egg	2.71	0.77	94.17
69	Tafel	Blackboard	2.71	0.70	100.00
70	Farbtöpfe	Paint pots	2.71	0.70	96.43
71	Spritze	Syringe	2.71	0.71	91.76
72	Käse	Cheese	2.71	0.54	98.91
73	Löffel	Spoon	2.70	0.46	100.00
74	Ritterburg	Knight’s castle	2.70	0.53	100.00
75	Staubsauger	Vacuum cleaner	2.70	0.55	98.91
76	Affe	Monkey	2.69	0.79	95.45
77	Rakete	Rocket	2.69	0.72	93.33
78	Trompete	Trumpet	2.69	0.79	99.01
79	Salat	Lettuce	2.68	0.77	95.18
80	Zahnbürste	Toothbrush	2.68	0.53	100.00
81	Hummel	Bumble-bee	2.67	0.64	90.80
82	CD	Compact disc	2.66	0.68	91.30
83	Pommes frites	French fries	2.66	0.54	100.00
84	Raupe	Caterpillar	2.66	0.63	97.80
85	Bogen	Bow	2.65	0.94	97.94
86	Dromedar	Dromedary	2.64	0.71	96.43
87	Schüssel	Bowl	2.64	0.73	91.76
88	Fahrradhelm	Bicycle helmet	2.63	0.73	99.03
89	Ritter	Knight	2.62	0.55	96.55
90	Krokodil	Crocodile	2.62	0.69	88.51
91	Locher	Hole puncher	2.61	0.85	92.68
92	Besen	Broom	2.60	0.68	95.60
93	Herd	Stove	2.59	0.75	95.19
94	Badewanne	Bathtub	2.59	0.61	96.74
95	Pistole	Pistol	2.58	0.75	84.26
96	Osterhase	Easter bunny	2.58	0.73	86.11
97	Sessel	Armchair	2.58	0.58	95.70
98	Schmetterling	Butterfly	2.58	0.50	100.00
99	Schildkröte	Turtle	2.57	0.52	98.85

100	Taucherbrille	Diving goggles	2.57	0.66	97.65
101	Küken	Chick	2.57	0.64	94.39
102	Anker	Anchor	2.57	0.91	95.96
103	Schnuller	Pacifier	2.57	0.80	97.06
104	Fernseher	Television set	2.56	0.50	100.00
105	Käfig	Cage	2.56	0.58	98.91
106	Salzstreuer	Salt cellar	2.56	0.90	91.09
107	Möhren	Carrots	2.55	0.57	100.00
108	Ananas	Pineapple	2.55	0.62	100.00
109	Kegel	Pins	2.55	0.84	96.55
110	Pfanne	Pan	2.54	0.64	98.82
111	Milch	Milk	2.54	0.96	93.67
112	Bügeleisen	Iron	2.54	0.74	93.33
113	Toilette	Toilet	2.53	0.57	100.00
114	Kartoffel	Potatoe	2.53	0.67	100.00
115	Waschmaschine	Washing machine	2.52	0.59	98.84
116	Schal	Scarf	2.51	0.89	95.00
117	Mülltonne	Garbage can	2.51	0.73	88.79
118	Vase	Vase	2.51	0.73	96.43
119	Feuerlöscher	Fire extinguisher	2.50	0.85	99.00
120	Papagei	Parrot	2.49	0.73	86.02
121	Tennisball	Tennis ball	2.49	0.71	90.70
122	Basketball	Basketball	2.49	0.62	93.52
123	Sparschwein	Piggy bank	2.48	0.83	87.78
124	Schraube	Screw	2.48	0.59	98.84
125	Toilettenpapier	Bathroom tissue	2.48	0.87	77.91
126	Chips	Chips	2.48	0.60	100.00
127	Pfeil	Arrow	2.47	0.89	86.41
128	Weihnachtsmann	Santa Claus	2.47	0.63	100.00
129	Trommel	Drums	2.46	0.60	97.83
130	Haselnuss	Hazelnut	2.46	1.01	93.98
131	Sonnenbrille	Sun glasses	2.46	0.74	98.80
132	Hamster	Hamster	2.46	0.97	81.71
133	Waschbecken	Washbasin	2.45	0.89	86.41
134	Spaten	Spade	2.45	0.90	78.02

135	Kürbis	Pumpkin	2.45	0.85	77.01
136	Vorhängeschloss	Padlock	2.44	0.98	91.84
137	Schiff	Ship	2.44	0.89	78.30
138	Seepferdchen	Seahorse	2.44	0.69	100.00
139	Laptop	Laptop	2.44	0.50	100.00
140	Kiwi	Kiwi fruit	2.44	0.52	98.85
141	Hundeleine	Dog leash	2.44	1.10	93.55
142	Lineal	Ruler	2.43	0.50	100.00
143	Hamburger	Hamburger	2.43	0.63	95.65
144	Gummibärchen	Gummi bears	2.43	1.03	97.37
145	Handtücher	Towels	2.42	0.90	100.00
146	Schaf	Sheep	2.41	0.74	88.04
147	Geldbeutel	Moneybag	2.41	0.77	92.22
148	Walnuss	Walnut	2.41	0.92	98.81
149	Großeltern	Grandparents	2.40	0.83	88.10
150	Rucksack	Backpack	2.40	1.04	84.81
151	Gelbe Säcke	Yellow bags	2.40	0.75	86.92
152	Lippenstift	Lipstick	2.40	0.55	96.77
153	Eichhörnchen	Squirrel	2.40	0.49	100.00
154	Anrichte	Sideboard	2.39	1.04	92.21
155	Orange	Orange	2.38	0.92	82.52
156	Heuballen	Hay bale	2.37	0.82	94.32
157	Grabstein	Gravestone	2.37	0.98	92.86
158	Bierglas	Beer glass	2.36	0.88	83.65
159	Kuchen	Cake	2.36	1.07	92.11
160	Hufeisen	Horseshoe	2.36	0.82	84.71
161	Ehering	Wedding ring	2.35	1.13	88.75
162	Jesuskreuz	Crucifix	2.35	0.85	86.54
163	Bleistift	Pencil	2.34	1.10	84.42
164	Gebiss	Set of teeth	2.34	0.70	93.41
165	Libelle	Dragonfly	2.34	0.95	96.91
166	Dosentomaten	Canned tomatoes	2.33	0.91	79.76
167	Huhn	Chicken	2.33	0.87	73.56
168	Geldmünzen	Coins	2.33	0.89	75.00
169	Rutsche	Slide	2.32	0.90	80.00

170	Zange	Pliers	2.32	1.17	89.74
171	Ruder	Oars	2.31	1.02	97.87
172	Wolle	Wool	2.31	0.98	81.61
173	Maus	Mouse	2.31	0.97	67.39
174	Teetasse	Tea cup	2.31	1.06	77.78
175	Croissant	Croissant	2.28	0.60	98.82
176	Bügelbrett	Ironing board	2.27	0.87	88.24
177	Liegestuhl	Deck chair	2.25	1.05	92.11
178	Kopfhörer	Headphones	2.25	1.03	87.18
179	Quietscheentchen	Rubber duck	2.25	0.67	87.10
180	Einkaufstüte	Grocery bag	2.25	1.01	80.23
181	Schatztruhe	Treasure chest	2.24	0.86	72.04
182	Tennisschläger	Tennis racket	2.23	0.86	85.54
183	Nähnadel	Sewing needle	2.23	1.21	93.33
184	Toaster	Toaster	2.23	0.53	97.83
185	Skier	Skis	2.22	0.80	93.14
186	Salzstangen	Salt stick	2.21	0.74	98.04
187	Schubkarre	Wheelbarrow	2.20	0.68	97.75
188	Wäschekorb	Laundry basket	2.20	0.86	91.36
189	Toast	Toast	2.19	0.70	90.11
190	Schraubenzieher	Screwdriver	2.17	0.82	90.24
191	CD-Hülle	Jewel case	2.17	0.97	88.10
192	Sandalen	Sandals	2.16	0.96	64.13
193	Batterie	Battery	2.15	0.45	100.00
194	Zigarette	Cigarette	2.15	0.96	95.79
195	Geburtstagstorte	Birthday cake	2.14	0.99	69.88
196	Basketballkorb	Basketball hoop	2.13	0.92	87.88
197	Kaffeetasse	Coffee mug	2.13	0.70	89.52
198	Glas Orangensaft	Glass of orange juice	2.13	0.98	70.87
199	Geige	Violin	2.13	0.94	74.70
200	Blumenstrauß	Bouquet of flowers	2.13	1.07	67.90
201	Bürste	Brush	2.12	0.97	60.75
202	Werkzeugkasten	Toolbox	2.12	0.88	88.37
203	Schachbrett	Chessboard	2.12	0.93	68.13
204	Gießkanne	Watering can	2.12	0.59	97.78

205	Fernbedienung	Remote control	2.11	0.89	100.00
206	Tauchflossen	Diving fins	2.11	0.64	95.24
207	Radiergummi	Rubber	2.11	0.98	94.74
208	Glühbirne	Light bulb	2.11	0.74	80.37
209	Feuerwehrauto	Fire truck	2.08	0.96	68.27
210	Hefter	Stapler	2.08	0.77	98.75
211	Teekanne	Tea pot	2.07	1.13	69.79
212	Aquarium	Fish tank	2.06	0.95	82.35
213	Strandspielzeug	Beach toys	2.06	1.09	73.96
214	Muffin	Muffin	2.05	0.63	92.22
215	Hausschuhe	Slippers	2.04	0.93	59.14
216	Korkenzieher	Cork-screw	2.04	1.08	86.96
217	Föhn	Hair dryer	2.03	0.94	98.92
218	Einkaufswagen	Shopping cart	2.02	1.01	61.80
219	Grashüpfer	Grasshopper	1.96	0.91	62.26
220	Fußballschuhe	Soccer shoes	1.94	0.77	91.25
221	Heißluftballon	Hot-air balloon	1.94	0.96	54.65
222	Flip-Flops	Flip-flops	1.94	1.00	64.37
223	Heugabel	Pitchfork	1.92	1.26	76.71
224	Nussknacker	Nutcracker	1.92	0.98	75.00
225	Pfarrer	Priest	1.92	1.05	92.13
226	Schachfigur	Chessman	1.91	1.19	71.43
227	Sarg	Coffin	1.91	0.75	89.53
228	Brautpaar	Bridal couple	1.89	0.95	66.67
229	Regal	Shelf	1.87	1.35	80.95
230	Gummistiefel	Gumboots	1.87	0.82	59.26
231	Suppenteller	Soup bowl	1.87	1.37	91.89
232	Dartscheibe	Dartboard	1.86	0.89	73.26
233	Schulbank	School desk	1.85	1.05	48.54
234	Waffeleisen	Waffle iron	1.85	1.28	83.75
235	Sandförmchen	Sand mould	1.84	1.18	75.86
236	Baumstamm	Tree log	1.82	0.92	58.43
237	Gehstock	Walking stick	1.82	1.03	64.10
238	Eisportionierer	Ice cream scoop	1.78	1.13	81.08
239	Kaffeemaschine	Coffee maker	1.76	0.82	92.47

240	Feuerstelle	Fireplace	1.75	1.32	74.36
241	Hamsterrad	Hamster wheel	1.75	1.15	63.89
242	Möwe	Seagull	1.74	0.97	46.15
243	Pfeffermühle	Pepper pot	1.72	1.27	94.59
244	Pizzaschneider	Pizza cutter	1.72	1.21	74.65
245	Dartpfeil	Dart	1.72	0.88	73.49
246	Schälmesser	Parer	1.71	1.22	96.92
247	Zollstock	Folding ruler	1.70	1.06	61.33
248	Thron	Throne	1.69	0.77	73.74
249	Ballettschuhe	Ballet shoes	1.69	0.72	74.42
250	Bowlingkugel	Bowling ball	1.68	0.90	84.62
251	Wanderschuhe	Hiking boots	1.67	0.90	37.93
252	Lautsprecher	Loudspeakers	1.64	1.02	56.58
253	Blumentopf	Flower pot	1.61	0.91	32.26
254	Baguette	Baguette	1.61	0.65	63.86
255	Spaghetti	Spaghetti	1.59	0.58	56.98
256	Cornflakes	Cornflakes	1.57	0.74	67.09
257	Bierflasche	Beer bottle	1.56	0.87	33.64
258	Angelhaken	Fish hook	1.56	1.04	40.96
259	Weinflasche	Wine bottle	1.56	0.95	31.73
260	Aschenbecher	Ashtray	1.56	1.37	90.77
261	Ballerina	Ballerina	1.53	0.84	60.98
262	Pfannkuchen	Pancake	1.49	1.06	76.92
263	Osterglocke	Daffodil	1.48	0.87	29.52
264	Skischuhe	Skiing boot	1.47	1.08	56.47
265	Sektglas	Champagne glass	1.46	0.91	32.67
266	Videorekorder	Video recorder	1.45	0.92	51.25
267	Geldscheine	Bills	1.42	0.85	25.56
268	Dosenöffner	Can opener	1.41	1.28	94.12
269	Videokassette	Video tape	1.35	0.83	44.44
270	Stereoanlage	Stereo	1.32	0.90	32.89
271	Stiftspäne	Waste of a pencil sharpener	1.31	1.21	67.27
272	Handrührgerät	Hand mixer	1.30	0.86	42.47
273	Zucchini	Zucchini	1.29	0.77	53.93
274	Garn	Thread	1.28	1.25	75.93

275	Cappuccino	Cappuccino	1.28	0.52	32.14
276	Saxophon	Saxophone	1.27	0.87	46.67
277	Sektflasche	Bottle of champagne	1.27	0.72	15.09
278	Patrone	Round	1.26	1.41	90.20
279	Zitruspresse	Citrus juicer	1.24	1.12	65.00
280	Geschenkband	Ribbon	1.20	0.96	26.67
281	Mond	Moon	1.16	1.23	52.38
282	Backformen	Baking pan	1.10	1.06	57.89
283	Discman	Personal CD player	1.04	1.20	78.85
284	Blume	Flower	1.02	0.21	1.15
285	Stempelkissen	Pad	1.02	1.23	58.70
286	Wasserwaage	Water level	1.01	1.12	83.72
287	Nudelholz	Rolling pin	1.01	1.03	28.07
288	Ofenhandschuh	Oven mitt	0.98	0.88	20.51
289	Honigwaben	Honeycomb	0.97	1.13	39.58
290	Schokoladenei	Chocolate egg	0.95	1.23	61.22
291	Geigenkasten	Violin case	0.94	0.60	6.85
292	Lidschatten	Eyeshadow	0.92	0.40	2.41
293	Tortenheber	Cake shovel	0.86	1.15	45.00
294	Teig	Pastry	0.80	1.19	60.61
295	Zuckerdose	Sugar bowl	0.74	0.93	25.00
296	Stricknadeln	Knitting needles	0.73	1.01	72.22
297	Gartentisch	Garden table	0.60	1.05	57.69
298	Stethoskop	Stethoscope	0.59	0.84	64.52
299	Salatschleuder	Salad spinner	0.59	1.02	51.85
300	Streichhölzer	Matches	0.23	0.71	88.89

Appendix C: List of Pairs and Relatedness Scores

No.	Object A	Object B	Relatedness Score	
			Mean	*SD*
1	Geldmünzen	Sparschwein	3.00	0.00
2	Schachfigur	Schachbrett	3.00	0.00
3	Fernbedienung	Fernseher	3.00	0.00
4	Farbtöpfe	Pinsel	2.99	0.10
5	Pirat	Schatzkiste	2.98	0.19
6	Taucherbrille	Flossen	2.98	0.29
7	Kanu	Ruder	2.98	0.21
8	Waschmaschine	Wäschekorb	2.98	0.15
9	Spitzer	Stiftspäne	2.98	0.25
10	Pfanne	Pfannkuchen	2.97	0.17
11	Fahrradhelm	Fahrrad	2.97	0.32
12	Eiswaffel	Eisportionierer	2.96	0.30
13	Geige	Geigenkasten	2.95	0.29
14	Bügelbrett	Bügeleisen	2.95	0.29
15	Blumenstrauß	Vase	2.95	0.25
16	Pferd	Hufeisen	2.95	0.29
17	Noten	Trompete	2.95	0.29
18	Heugabel	Heuballen	2.95	0.21
19	Toaster	Toast	2.95	0.35
20	Blume	Hummel	2.95	0.21
21	Fußballschuhe	Fußball	2.95	0.35
22	Papagei	Käfig	2.94	0.36
23	Videorekorder	Videokassette	2.94	0.41
24	Feuerwehrauto	Feuerlöscher	2.94	0.23
25	Laufrad	Hamster	2.94	0.37
26	Karotten	Hase	2.94	0.37
27	Basketballkorb	Basketball	2.93	0.40
28	Strandspielzeug	Sandförmchen	2.93	0.40
29	Weihnachtsmann	Christbaum	2.93	0.36

30	Baby	Schnuller	2.93	0.38
31	Ampel	Auto	2.93	0.32
32	Mütze	Schal	2.92	0.46
33	Hose	Jacke	2.92	0.34
34	Dosenöffner	Dosentomaten	2.92	0.40
35	Cornflakes	Milch	2.92	0.37
36	Laptop	Computermaus	2.92	0.46
37	Bogen	Pfeil	2.91	0.48
38	Burg	Ritter	2.91	0.46
39	Kochtopf	Spaghetti	2.91	0.42
40	CD	CD-Hülle	2.90	0.47
41	Tennisball	Tennisschläger	2.90	0.47
42	Stempel	Stempelkissen	2.90	0.45
43	Spritze	Stethoskop	2.90	0.43
44	Pfarrer	Jesuskreuz	2.90	0.46
45	Ballerina	Ballettschuhe	2.90	0.48
46	Hundeleine	Hund	2.90	0.53
47	Raupe	Schmetterling	2.89	0.48
48	Käse	Maus	2.89	0.44
49	Discman	Kopfhörer	2.89	0.53
50	Toilette	Toilettenpapier	2.89	0.48
51	Batterie	Taschenlampe	2.89	0.47
52	Haselnuss	Eichhörnchen	2.88	0.49
53	Krone	Thron	2.88	0.58
54	Sektflasche	Sektglas	2.88	0.56
55	Zange	Werkzeugkasten	2.88	0.54
56	Rose	Osterglocke	2.88	0.52
57	Bierflasche	Bierglas	2.88	0.55
58	Stereoanlage	Lautsprecher	2.88	0.44
59	Lippenstift	Lidschatten	2.87	0.46
60	Geburtstagstorte	Geschenk	2.87	0.53
61	Geldbeutel	Geldscheine	2.87	0.46
62	Schlüssel	Vorhängeschloss	2.86	0.53
63	Nägel	Hammer	2.86	0.55
64	Schiff	Anker	2.86	0.61
65	Waffeleisen	Waffel	2.85	0.56

66	Mülltonne	Müllsäcke	2.85	0.62
67	Orange	Glas Orangensaft	2.85	0.54
68	Kaffeemaschine	Kaffeetasse	2.85	0.56
69	Blumentopf	Gießkanne	2.85	0.60
70	Croissant	Baguette	2.85	0.41
71	Muffin	Backformen	2.84	0.58
72	Teig	Nudelholz	2.84	0.51
73	Badewanne	Quietscheentchen	2.84	0.52
74	Dartpfeil	Dartscheibe	2.84	0.62
75	Messer	Gabel	2.84	0.66
76	Mond	Rakete	2.84	0.55
77	Glühbirne	Lampe	2.83	0.68
78	Teekanne	Teetasse	2.83	0.52
79	Bleistift	Radiergummi	2.82	0.54
80	Skischuhe	Skier	2.82	0.65
81	Schälmesser	Kartoffel	2.82	0.60
82	Pizza	Pizzaschneider	2.81	0.58
83	Einkaufstüte	Einkaufswagen	2.81	0.68
84	Schokoladenei	Schokoladenhase	2.81	0.61
85	Patrone	Pistole	2.81	0.62
86	Küken	Ei	2.81	0.62
87	Schaukel	Rutsche	2.79	0.66
88	Tortenheber	Kuchen	2.79	0.63
89	Säge	Baumstamm	2.78	0.63
90	Löffel	Suppenteller	2.78	0.63
91	Ofenhandschuh	Ofen/Herd	2.78	0.72
92	Zitrone	Zitruspresse	2.78	0.67
93	Kürbis	Fledermaus	2.78	0.50
94	Schraubenzieher	Schraube	2.78	0.63
95	Spaten	Schubkarre	2.77	0.71
96	Bowlingkugel	Kegel	2.77	0.75
97	Tafel	Schulbank	2.76	0.59
98	Weinflasche	Korkenzieher	2.76	0.68
99	Walnuss	Nussknacker	2.76	0.73
100	Gehstock	Großeltern	2.76	0.59
101	Sandalen	Flip-Flops	2.75	0.53

102	Banane	Affe	2.74	0.55
103	Ring	Kette	2.74	0.60
104	Geschenkband	Schere	2.74	0.57
105	Waschbecken	Handtücher	2.74	0.67
106	Ehering	Brautpaar	2.74	0.73
107	Pommes frites	Hamburger	2.74	0.67
108	Zahnbürste	Gebiss	2.74	0.78
109	Zigarette	Aschenbecher	2.74	0.75
110	Bürste	Fön	2.72	0.71
111	Regal	Anrichte	2.71	0.60
112	Ente	Möwe	2.70	0.58
113	Angelhaken	Fisch	2.70	0.65
114	Regenschirm	Gummistiefel	2.69	0.76
115	Trommel	Saxofon	2.69	0.68
116	Grabstein	Sarg	2.68	0.81
117	Liegestuhl	Gartentisch	2.67	0.55
118	Gummibärchen	Schokolade	2.66	0.68
119	Seepferdchen	Seestern	2.63	0.72
120	Turnschuhe	Socke	2.63	0.53
121	Wolle	Stricknadel	2.61	0.84
122	Handrührgerät	Schüssel	2.61	0.68
123	Rucksack	Wanderschuhe	2.60	0.67
124	Besen	Staubsauger	2.58	0.71
125	Kiwi	Ananas	2.58	0.63
126	Zirkel	Lineal	2.56	0.77
127	Salat	Salatschleuder	2.56	0.84
128	Strohhut	Sonnenbrille	2.56	0.70
129	Pfeffermühle	Salzstreuer	2.55	0.71
130	Wasserwaage	Zollstock	2.55	0.76
131	Feuerstelle	Zelt	2.52	0.67
132	Zucchini	Paprika	2.51	0.70
133	Salzstangen	Chips	2.50	0.86
134	Garn	Nähnadel	2.49	1.05
135	Hefter	Locher	2.43	0.75
136	Treppe	Tür	2.41	0.71
137	Grashüpfer	Libelle	2.40	0.84

138	Pinguin	Eisbär	2.33	0.78
139	Huhn	Wurm	2.32	0.87
140	Hausschuhe	Sessel	2.25	0.83
141	Strandspielzeug	Seestern	2.16	0.83
142	Schildkröte	Krokodil	2.13	0.92
143	Elefant	Löwe	2.13	0.75
144	Flugzeug	Heißluftballon	2.11	0.74
145	Honigwaben	Bär	2.11	0.98
146	Dromedar	Palme	2.06	0.85
147	Cappuccino	Zucker	2.06	0.91
148	Kuh	Schaf	2.03	0.78
149	Bauklötze	Clown	2.01	0.81
150	Katze	Aquarium	1.61	0.76
151	Wolle	Einkaufswagen	1.45	0.63
152	Kerze	Streichhölzer	1.41	0.90
153	Suppenteller	Ofenhandschuh	1.38	0.61
154	Gummistiefel	Müllsäcke	1.34	0.62
155	Bleistift	Spritze	1.28	0.55
156	Geigenkasten	Christbaum	1.28	0.54
157	Basketballkorb	Fahrrad	1.22	0.59
158	Kopfhörer	Kaffeetasse	1.20	1.28
159	Sandförmchen	Schal	1.20	0.53
160	Hamsterrad	Salatschleuder	1.20	0.54
161	Blume	Huhn	1.19	0.46
162	Möhren	Tortenheber	1.18	0.52
163	Discman	Aschenbecher	1.17	0.52
164	Sektglas	Croissant	1.16	0.43
165	Anrichte	Geburtstagstorte	1.14	0.37
166	Topf	Baguette	1.14	0.37
167	Pfarrer	Tafel	1.14	0.37
168	Zange	Gießkanne	1.13	0.39
169	Schirm	Skischuhe	1.13	0.50
170	Rakete	Jacke	1.11	0.56
171	Ampel	Bauklötze	1.11	0.44
172	Osterglocke	Herd	1.11	0.47
173	Sektflasche	Spaghetti	1.11	0.40

174	Pfanne	Salzstangen	1.10	0.37
175	Vorhängeschloss	Thron	1.10	0.39
176	Flugzeug	Kiwi	1.10	0.39
177	Tauchflossen	Waschmaschine	1.09	0.40
178	Strohhut	Pfannkuchen	1.09	0.35
179	Ananas	Rucksack	1.08	0.39
180	Schachfigur	Haselnuss	1.08	0.48
181	Garn	Papagei	1.08	0.51
182	Schraubenzieher	Radiergummi	1.08	0.52
183	Schüssel	Fußball	1.08	0.38
184	Burg	Nudelholz	1.08	0.38
185	Treppe	Schokolade	1.08	0.37
186	Schiff	Pfeil	1.07	0.45
187	Weinflasche	Basketball	1.07	0.42
188	Palme	Geschenk	1.07	0.32
189	Hase	Fernseher	1.07	0.40
190	Dromedar	Regal	1.07	0.32
191	Ente	Feuerstelle	1.06	0.44
192	Fernbedienung	Kuchen	1.06	0.37
193	Löffel	Rose	1.06	0.31
194	Bär	Tennisball	1.06	0.27
195	Pinsel	Handrührgerät	1.06	0.34
196	Gartentisch	Kürbis	1.06	0.30
197	Trommel	Schubkarre	1.06	0.30
198	Großeltern	Hufeisen	1.06	0.23
199	Zuckerdose	Liegestuhl	1.06	0.38
200	Sessel	Werkzeugkasten	1.06	0.27
201	Zahnbürste	Zitruspresse	1.06	0.33
202	Baumstamm	Besen	1.05	0.29
203	Lippenstift	Schaf	1.05	0.40
204	Schokoladenhase	Pistole	1.05	0.34
205	Noten	Schnuller	1.05	0.40
206	Heuballen	Pizzaschneider	1.05	0.50
207	Sonnenbrille	Chips	1.05	0.36
208	Stethoskop	Schraube	1.05	0.33
209	Schulbank	Bürste	1.05	0.38

210	Gebiss	Nägel	1.04	0.30
211	Grabstein	Säge	1.04	0.41
212	Muffin	Schachbrett	1.03	0.41
213	Kuh	Toaster	1.03	0.35
214	Teetasse	Feuerlöscher	1.03	0.32
215	Aquarium	Schere	1.03	0.32
216	Bügeleisen	Teekanne	1.03	0.39
217	Fisch	Rutsche	1.03	0.41
218	Heugabel	Banane	1.03	0.28
219	Baby	Ei	1.03	0.44
220	Schildkröte	Gummibärchen	1.03	0.18
221	Libelle	Waffeleisen	1.03	0.23
222	Krokodil	Tür	1.03	0.27
223	Toilette	Pinguin	1.03	0.29
224	Dartscheibe	Messer	1.03	0.25
225	Dosentomaten	Stiftspäne	1.03	0.21
226	Sarg	Staubsauger	1.03	0.29
227	Weihnachtsmann	Cornflakes	1.03	0.29
228	Eisportionierer	Hummel	1.03	0.21
229	Schälmesser	Hamburger	1.03	0.21
230	Mond	Elefant	1.02	0.37
231	Kanu	Schokoladenei	1.02	0.37
232	Pirat	Geschenkband	1.02	0.34
233	Maus	Videorekorder	1.02	0.26
234	Schatztruhe	Katze	1.02	0.34
235	Ring	Flip-Flops	1.02	0.30
236	Pizza	Affe	1.02	0.34
237	Eichhörnchen	Backformen	1.02	0.34
238	Schlüssel	Orange	1.02	0.21
239	Glas Orangensaft	Krone	1.02	0.18
240	Blumentopf	Hausschuhe	1.02	0.31
241	Ballerina	Walnuss	1.02	0.19
242	Pommes frites	Ehering	1.02	0.19
243	Milch	Geige	1.02	0.24
244	Batterie	Gehstock	1.02	0.19
245	Pferd	Taschenlampe	1.02	0.31

246	Einkaufstüte	Stempelkissen	1.02	0.19
247	Brautpaar	Kartoffel	1.02	0.19
248	Badewanne	Ballettschuhe	1.02	0.19
249	Videokassette	Geldmünzen	1.01	0.28
250	Hose	Löwe	1.01	0.28
251	Eiswaffel	Wurm	1.01	0.28
252	Auto	Paprika	1.01	0.32
253	Patrone	Ruder	1.01	0.44
254	Computermaus	Honigwaben	1.01	0.23
255	Fußballschuhe	Farbtöpfe	1.01	0.10
256	Kaffeemaschine	Zigarette	1.01	0.28
257	Waffel	Waschbecken	1.01	0.28
258	Mütze	Seepferdchen	1.01	0.10
259	Locher	Ritter	1.01	0.23
260	Zollstock	Salat	1.01	0.32
261	Dosenöffner	Vase	1.01	0.40
262	Taucherbrille	Kerze	1.01	0.32
263	Zirkel	Gabel	1.01	0.26
264	Toilettenpapier	Stereoanlage	1.01	0.22
265	Cappuccino	Fledermaus	1.01	0.22
266	Bowlingkugel	Spaten	1.00	0.33
267	Spitzer	Blumenstrauß	1.00	0.00
268	Zitrone	Hammer	1.00	0.00
269	Kegel	Saxofon	1.00	0.00
270	Nussknacker	Quietscheentchen	1.00	0.24
271	Nähnadel	CD-Hülle	1.00	0.37
272	CD	Käfig	1.00	0.26
273	Bügelbrett	Feuerwehrauto	1.00	0.30
274	Toast	Lidschatten	1.00	0.26
275	Hundeleine	Strumpf	1.00	0.21
276	Zelt	Salzstreuer	1.00	0.21
277	Geldbeutel	Schaukel	1.00	0.26
278	Laptop	Tennisschläger	1.00	0.39
279	Fahrradhelm	Korkenzieher	1.00	0.18
280	Skier	Mülltonne	1.00	0.15
281	Dartpfeil	Lineal	0.99	0.22

282	Streichhölzer	Wäschekorb	0.99	0.52
283	Stempel	Stricknadel	0.99	0.26
284	Heißluftballon	Wanderschuhe	0.99	0.10
285	Lampe	Turnschuhe	0.99	0.28
286	Angelhaken	Geldscheine	0.99	0.28
287	Trompete	Küken	0.99	0.39
288	Schmetterling	Kette	0.99	0.28
289	Sandalen	Raupe	0.99	0.28
290	Bierflasche	Bogen	0.99	0.28
291	Grashüpfer	Handtücher	0.99	0.10
292	Jesuskreuz	Fön	0.99	0.28
293	Pfeffermühle	Möwe	0.98	0.30
294	Clown	Zucchini	0.98	0.34
295	Sparschwein	Käse	0.98	0.21
296	Bierglas	Anker	0.98	0.30
297	Teig	Hefter	0.98	0.33
298	Hamster	Wasserwaage	0.97	0.29
299	Glühbirne	Hund	0.97	0.18
300	Eisbär	Lautsprecher	0.96	0.19

Appendix D: Naming Questionnaire

 Nr.	Schreibe auf! *(Please note!)* Das Bild zeigt ... *(The picture shows…)*
1	
2	
3	
4	
5	
6	

Appendix E: Rating of Association Strength Form

 Nr.	Kreuze an! *(Check a box!)* Wie gut passen die beiden Objekte zusammen? *(How well do these objects match?)*		
1	☺ ☐	😐 ☐	☹ ☐
2	☺ ☐	😐 ☐	☹ ☐
3	☺ ☐	😐 ☐	☹ ☐
4	☺ ☐	😐 ☐	☹ ☐
5	☺ ☐	😐 ☐	☹ ☐
6	☺ ☐	😐 ☐	☹ ☐