

The Indonesian Boston Naming Test: Normative Data among Healthy Adults and Effects of Age and Education on Naming Ability

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Abstract: *The purpose of the current study was to introduce the Indonesian Boston Naming Test (I-BNT) and to present normative data for the BNT based on a sample of Indonesian adults. Two hundred healthy adults, ages range from 16 – 89 years old, participated in the current study. Relationships between BNT variable and demographic characteristics – i.e. age, education, and gender – were calculated using Pearson’s correlation coefficient and t-test analysis for dichotomous variable. Both age and education were significantly associated with the BNT, and no gender differences were found. The inclusion of typical Indonesian target words and correct response analysis of items were also investigated. The obtained norms were shown to be relatively lower than published norms for comparable North-American adults, but slightly higher when compared to obtained BNT norms of other countries. Comparing the USA-BNT and I-BNT resulted in conclusion that the adapted I-BNT is appropriate for use in Indonesia, and the reordering of items reflecting difficulty-order of the items for Indonesian sample is presented for clinical use.*

Keywords: Boston Naming Test, normative data, response analysis, Indonesian adults

1. Introduction

Boston Naming Test is most widely used by clinical practitioners, neuropsychologists and researchers in cognitive function assessment in picture naming [1], [2], [3]. Picture naming and sentence completion test are found to be associated with naming and word-retrieval disturbances which are frequently accounted for all types of aphasia [4], [5]. Naming or word recalling ability involves processes from recognizing a stimulus to using phonological and semantic system [6]. Hence, BNT can also be used to detect problems on naming an object that may resulted from certain brain damage and may help provide information about the location of the damage either by using the semantic or phonological system of cues [7].

Boston Naming Test for adults population has been translated and adapted into several languages and normative data for this population were created, such as for Korean BNT, Swedish-BNT, Brazilian BNT, Malay BNT, Greek BNT, and for Spanish BNT [8], [9], [10], [11], [12], [13]. Some other studies were specifically aiming at investigating BNT for elderly people, such as Mariën, Mampaey, Vervaeke, Saerens, and De Deyn’s study who involving native Dutch-speaking elderly Belgian and Leite, Miotto, Nitrini, and Yassuda’s study who involving illiterate and low-educated older adults in their studies [14], [15]. However, there has been no report of translation and adaptation studies of Boston Naming Test for Indonesian adult population as well as the normative data of the test. The current study aimed to present the Indonesian BNT and normative data for adult population.

2. Literature Survey

The standard BNT consists of 60 pictures in black and white drawings, while modified and shortened versions of BNT were also being used in some studies, e.g. 38-items of BNT for adults Maltese, 30-items of BNT for Spanish-speaking older respondents with and without dementia who live in USA, Colombia, and Spain [1], [5], [16]. The translation from the English-BNT into other languages and the decision of what pictures supposed to be used on the test are of some important aspects that demand careful consideration [8], [15]. The adaptation of picture confrontation tests such as BNT to other populations with different cultures and languages requires several considerations [9]. First, it is related with the selection of which pictures that might be appropriate for new population and represent the knowledge among the people. Secondly, the linguistic features of the target words might be impossible to be exactly comparable, therefore there might be a problem regarding the alteration of the pictures from the original BNT for English-speaking population into other languages. Third, the word form of the pictures presented in the new adapted version may differ essentially in terms of the phonological complexity, word-length, order of difficulties, and alike. Therefore, the current study also aimed at investigating the choice of target words and related pictures by analyzing the frequency of correct responses and comparing the result with the English version of BNT for North American because this latter study and the current study involved comparably similar characteristics of respondents in terms of ages and educational backgrounds [17]. The later result from the current study subsequently served as the basis of creating the new order of the Indonesian Boston Naming Test because this test is usually presenting the item test from the easiest to difficult ones and degrees of frequency and familiarity of the objects [13], [14], [18].

Construction of the Indonesian BNT

The number of the Indonesian BNT is the same as in the long-form of original BNT. The original version of the 60-items BNT (Kaplan, Goodglass, & Weintraub, 1983) was the starting point for developing the Indonesian version of BNT with several pictures were changed in order to incorporate cultural differences. The change of the target words in Bahasa Indonesia were based on consensus between linguists, neuropsychologists, and researchers from Indonesia by choosing words and pictures that were part of local knowledge and considering difficulty level of the objects. There were 17 words that had been changed as the new target words for the use in Indonesia. The changes were as follows: (1) octopus by squid; (2) pretzel by bread; (3) beaver by rat; (4) harmonica by *seruling*; (5) acorn by nut; (6) igloo by *Rumah Gadang*; (7) harp by guitar; (8) hammock by tent; (9) knocker by doorbell; (10) pelican by pigeon; (11) unicorn by *wayang*; (12) accordion by *gendang*; (13) asparagus by carrot; (14) tripod by telescope; (15) tongs by hoe; (16) sphynx by *Monumen Nasional*; (17) yoke by saddle.

We changed all the music instruments into local instruments that have similar way of use and considered part of knowledge of Indonesian people. Typical house such Igloo was replaced with typical house from West Sumatra, namely *Rumah Gadang*. Animals, such as beaver and pelican, and some appliances, such as knocker, tripod, tongs and yoke, were replaced according to familiarity of use among Indonesian. Knowledge of how normal population typically names objects can be of further help in the decisions of which responses that should be regarded as correct. Hence in a specific case, we also accepted that when almost more than half of the participants used the same name on an object, it was decided that the correct answer for the item will be both of the initial target word and the word answered by the participants. For example, the semantic association for Igloo for Indonesian people is *Rumah Gadang*, a well-known, typical house from West Sumatera. On the preliminary data gathering, there were participants who named the house as “*Rumah Padang*” and “*Rumah Minang*”, which is also true as the local name of *Rumah Padang* is *Rumah Gadang* and *Rumah Minang*. Therefore, we decided that this item has three names that can be accepted as correct answer, either *Rumah Padang*, *Rumah Gadang* or *Rumah Minang*.

3. Methods

Participants

Participants of this study were 200 healthy people who live in Central Java, Indonesia. They predominantly represented Java population and its dialectical features. The sample is representative with regard to variation in age, gender, and education, although culturally it might only represent sample of population in Java Island. The age of the participants ranges from 16 to 89 years old ($M = 33.8$ years), with more females ($N = 128$, 64%) than males involved. Table 1 showed that of these 200 people mostly had completed high school study ($N = 125$, 62%), and the rests 51 (25.5%), 15 (7.5%), 9 (4.5%) had completed undergraduate study, college education (diploma/vocational education), and graduate study, respectively. All participants reported no history of psychiatric or neurological diseases or with head

trauma, or other illnesses that might have influenced the performance on the test.

Table 1: Demographic characteristics of the subjects

		Number (%)
Sex	Female	128 (64%)
	Male	72 (36%)
Age	16 – 25	99 (49.5%)
	26 – 35	28 (14%)
	36 – 45	20 (11%)
	46 – 55	26 (13%)
	>56	27 (13.5%)
Education	High School	125 (62%)
	College (Diploma)	15 (7.5%)
	University (Undergraduate)	51 (25.5%)
	University (Graduate)	9 (4.5%)

* $N = 200$

Administration of BNT

All participants were tested individually using the 60-item of Indonesian Boston Naming Test (I-BNT). All 60 items of BNT were administered to participants and the test began with the item number one. We retain the protocol of administration as being used in the original English version of BNT. All 60 responses were given a 20s limit on the first trial, and subsequent 2 x 20s minute for a-phonemic and semantic/stimulus cueing were given, respectively. All responses gathered in this preliminary study were all recorded by writing down all the responses (spontaneous responses, a-phonemic cueing, and semantic/stimulus cueing). The standard discontinuation was applied by using criterion of failure to name objects on six consecutive trials.

4. Analysis and Results

Analysis of the normative data

In normative studies of BNT, demographic factors usually are well known and a stratified selection has been made regarding age, gender, and education [5], [8], [14], [15], [18]. Table 2, 3, 4, and 5 provide normative data of Indonesian Boston Naming Test that are stratified by age, education, simultaneously age and education, and gender-based differences.

Table 2: Results of the Boston Naming Test stratified by Age

	M (SD)	Range	Median value	Cut-off scores
16 – 25 y.o.	52.3 (4.7)	35 – 60	53	42.9
26 – 35 y.o.	54.8 (3.6)	49 – 60	55.5	47.6
36 – 45 y.o.	53.8 (4.3)	40 – 60	54.5	45.2
45 – 55 y.o.	48.4 (7.1)	33 – 59	49	34.2
>56 y.o.	49.3 (8.7)	25 – 60	51	31.9

* $N = 200$

Table 3: Results of the Boston Naming Test stratified by Education

	M (SD)	Range	Median value	Cut-off scores
High School	50.9 (5.8)	26 – 60	52	39.3
College (Diploma)	51.1 (5.9)	38 – 59	53	39.3
University (Undergraduate)	53.9 (5.9)	25 – 60	55	42.1
University (Graduate)	56.2 (3.2)	50 – 60	58	49.8

* $N = 200$

Table 4: Results of the Boston Naming Test stratified by Age and Education

	Age (years)					Total
	16 – 25	26 – 35	36 – 45	46 – 56	>56	
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)
Education						
High School	52.0 (4.7)	53.0 (2.8)	51.0 (5.3)	46.1 (7.5)	48.3 (6.9)	50.9 (5.7)
Diploma (vocational)	51.5 (3.7)	53.7 (5.0)	57 (-)	50.0 (6.3)	46.5 (12.1)	51.1 (5.9)
University (Undergraduate)	54.5 (4.7)	54.9 (3.6)	55.1 (2.9)	53.0 (4.9)	48.8 (12.4)	53.8 (5.9)
University (Graduate)	-	57.2 (2.9)	-	52.5 (3.5)	57.3 (2.1)	56.2 (3.2)
Total	52.3 (4.7)	54.8 (3.6)	53.8 (4.3)	48.4 (7.1)	49.3 (8.7)	51.9 (5.9)

*N = 200

Table 5: BNT for Gender Groups

Gender Categories	Number of subjects	BNT Profile		
		M	SD	Range
Female	128	51.6	5.6	26 – 60
Male	72	52.4	6.4	25 – 60

Comparison of the obtained Mean and Standard Deviation of BNT across countries

Table 6 shows that the obtained norms of Indonesian BNT (I-BNT) is relatively lower than the USA-BNT, but in average were higher than that of other studies.

Table 6: Comparisons of BNT studies across countries

	M (SD)	(SD)	Sample size	Cronbach Alpha
Tombaugh & Hubley (USA)	54.3	(3.7)	219	.78
Marien et al. (Belgium)	51.9	(5.5)	200	-
Tallberg (Sweden)	47.58	(4.5)	111	.76
Mansur et al. (Brazil)	41.6	(9.5)	133	-
Patricacou (Greece)	42.9	(9.8)	100	-
Sulastris et al. (Java - Indonesia)	51.9	(5.9)	200	.86

Comparison of the correct analysis between USA BNT and I-BNT and New Order of I-BNT

Table 7 shows that almost all items were comparably responded correctly by respondents of both countries, with maximum <5% deviations either lower or higher correct responses, except for globe, wreath, nut, Rumah Padang, pyramid, muzzle, noose, scroll, and trellis that had higher wrong responses, while abacus was responded correctly higher than that of the USA-BNT. Table 8 provides information of the new order of I-BNT based on degrees of difficulty of the items.

Table 7: Comparison of the correct responses between USA-BNT and Indonesian-BNT

	English Target Words	Correct responses (in percentage)	Indonesian Target Words	Correct responses (in percentage)
1	Bed	100	Tempat tidur	97
2	Tree	100	Pohon	99.5
3	Pencil	100	Pensil	100
4	House	100	Rumah	100
5	Whistle	99.5	Peluit	95.5
6	Scissors	100	Gunting	100
7	Comb	100	Sisir	100

8	Flower	100	Bunga	99.5
9	Saw	100	Gergaji	100
10	Toothbrush	100	Sikat gigi	99.5
11	Helicopter	99.1	Helikopter	97
12	Broom	100	Sapu	99.5
13	Octopus	90	Cumi-cumi	97
14	Mushroom	99.5	Jamur	98
15	Hanger	100	Gantungan baju	86.5
16	Wheelchair	100	Kursi roda	99
17	Camel	99.1	Onta	99.5
18	Mask	98.6	Topeng	95
19	Pretzel	92.2	Roti tawar	91
20	Bench	99.5	Kursi	100
21	Racquet	100	Raket	97
22	Snail	95.4	Siput	93
23	Volcano	97.7	Gunung api	82.5
24	Seahorse	84.6	Kuda laut	92
25	Dart	98.6	Anak panah	85
26	Canoe	100	Perahu	93
27	Globe	96.8	Bola dunia	61
28	Wreath	99.5	Karangan Bunga	41.5
29	Beaver	97.5	Tikus	99.5
30	Harmonica	96.8	Suling	93
31	Rhinoceros	90.4	Badak	94.5
32	Acorn	93.6	Kacang tanah	69
33	Igloo	99.1	Rumah Padang/Gadang	65
34	Stilts	95.0	Enggrang	80
35	Dominoes	90.9	Kartu	93.5
36	Cactus	100	Kaktus	94.5
37	Escalator	99.1	Eskalator	87
38	Harp	97.3	Gitar	99.5
39	Hammock	94.1	Tenda	98
40	Knocker	97.7	Bel	93.5
41	Pelican	92.7	Burung merpati/dara	92.5
42	Stethoscope	95	Stetoskop	86.5
43	Pyramid	96.8	Piramid	75
44	Muzzle	92.7	Moncong	27
45	Unicorn	91.3	Wayang	95.5
46	Funnel	96.3	Corong	92.5
47	Accordion	81.7	Gendang	87
48	Noose	91.3	Simpul	74
49	Asparagus	93.6	Wortel	100
50	Compass	69	Kompas	88.5
51	Latch	80.8	Engsel pintu	75.5
52	Tripod	89.5	Teropong	75.5
53	Scroll	92.7	Gulungan kertas	58
54	Tongs	84.5	Cangkul	89
55	Sphinx	75.8	Monas	91.5
56	Yoke	63	Pelana	58.5
57	Trellis	77.2	Teralis	46
58	Pallette	69	Palet	46
59	Protactor	39.7	Busur (derajat)	41.5
60	Abacus	57.5	Semboa	80

Table 8: Target words of the English version and New Order of the final version of the Indonesian BNT

Item No	English Target Words	Indonesian Target words	Item No.	English Target Words	Total correct number (percentages)
1.	Bed	Tempat tidur	33	Pencil	200 (100%)
2.	Tree	Pohon	1	House	200 (100%)
3.	Pencil	Pensil	2	Scissor	200 (100%)
4.	House	Rumah	3	Comb	200 (100%)
5.	Whistle	Peluit	34	Saw	200 (100%)
6.	Scissor	Gunting	4	Bench	200 (100%)
7.	Comb	Sisir	5	Asparagus	200 (100%)

				(Carrot)	
8.	Flower	Bunga	6	Tree	199 (99.5%)
9.	Saw	Gergaji	7	Flower	199 (99.5%)
10.	Toothbrush	Sikat gigi	8	Toothbrush	199 (99.5%)
11.	Helicopter	Helikopter	20	Camel	199 (99.5%)
12.	Broom	Sapu	29	Beaver (Rat)	199 (99.5%)
13.	Octopus	Cumi-cumi	26	Harp (Guitar)	199 (99.5%)
14.	Mushroom	Jamur	30	Broom	199 (99.5%)
15.	Hanger	Gantungan baju	28	Wheelchair	198 (99%)
16.	Wheelchair	Kursi roda	9	Mushroom	196 (98%)
17.	Camel	Onta	10	Hammock (Tent)	196 (98%)
18.	Mask	Topeng	40	Racquet	194 (97%)
19.	Pretzel	Roti tawar	19	Helicopter	194 (97%)
20.	Bench	Kursi	11	Octopus (Squid)	194 (97%)
21.	Racquet	Raket	12	Bed	194 (97%)
22.	Snail	Siput	13	Unicorn (Puppet)	191 (95.5%)
23.	Volcano	Gunung api	47	Whistle	191 (95.5%)
24.	Seahorse	Kuda laut	31	Mask	190 (95%)
25.	Dart	Anak panah	48	Cactus	189 (94.5%)
26.	Canoe	Perahu	36	Rhinoceros	189 (94.5%)
27.	Globe	Bola dunia	44	Knocker (Bel)	187 (93.5%)
28.	Wreath	Karangan Bunga	59	Dominoes	187 (93.5%)
29.	Beaver	Tikus	14	Snail	186 (93%)
30.	Harmonica	Suling	41	Canoe	186 (93%)
31.	Rhinoceros	Badak	46	Harmonica (Suling)	186 (93%)
32.	Acorn	Kacang tanah	45	Pelican (Pigeon)	185 (92.5%)
33.	Igloo	Rumah Padang/Gadang	35	Funnel	185 (92.5%)
34.	Stilts	Enggrang	54	Seahorse	184 (92%)
35.	Dominoes	Kartu	27	Sphinx (Monas)	183 (91.5%)
36.	Cactus	Kaktus	23	Pretzel (Bread)	182 (91%)
37.	Escalator	Eskalator	24	Tongs (Hoe)	178 (89%)
38.	Harp	Gitar	15	Compass	177 (88.5%)
39.	Hammock	Tenda	32	Escalator	174 (87%)
40.	Knocker	Bel	21	Accordion (Gendang)	174 (87%)
41.	Pelican	Burung merpati/dara	43	Hanger	173 (86.5%)
42.	Stethoscope	Stetoskop	50	Stethoscope	173 (86.5%)
43.	Pyramid	Piramid	25	Protractor	170 (85%)
44.	Muzzle	Moncong	55	Dart	170 (85%)
45.	Unicorn	Wayang	22	Volcano	165 (82.5%)
46.	Funnel	Corong	51	Abacus	160 (80%)
47.	Accordion	Gendang	49	Stilts	160 (80%)
48.	Noose	Simpul	52	Latch	151 (75.5%)
49.	Asparagus	Wortel	16	Tripod (Telescope)	151 (75.5%)
50.	Compass	Kompas	39	Pyramid	150 (75%)
51.	Latch	Engsel pintu	42	Noose	148 (74%)
52.	Tripod	Teropong	53	Acorn (Nut)	138 (69%)
53.	Scroll	Gulungan kertas	58	Igloo (Rumah Padang)	130 (65%)
54.	Tongs	Cangkul	17	Globe	122 (61%)
55.	Sphinx	Monas	18	Yoke (Saddle)	117 (58.5%)
56.	Yoke	Pelana	56	Scroll	116 (58%)
57.	Trellis	Teralis	57	Trellis	92 (46%)
58.	Pallet	Palet	60	Pallet	92 (46%)

59.	Protractor	Busur (derajat)	37	Wreath	83 (41.5%)
60.	Abacus	Semboja	38	Muzzle	54 (27%)

Statistical Analysis

A Person product-moment analysis was employed to determine the relationship between the BNT scores, age, and education. A significantly positive correlation was found between BNT scores and education ($r = .26, p < .001$), and a significant negative correlation was found between BNT scores and age ($r = -.22, p < .001$). To investigate whether females and males differ in the performance of Indonesian BNT (I-BNT), a *t-test* was performed. There was no difference between females and males on I-BNT: $t(198) = -.82, p = .412$, females ($M = 51.6, SD = 5.6$) scored relatively similar with males ($M = 52.3, SD = 6.4$).

5. Discussion

In this current study the adaptation of the original English of the Boston Naming Test (BNT) to the Indonesian BNT and the inclusion of cultural aspects with regard to contextually familiar knowledge among Indonesian people were investigated [12], [15], [19]. This study was the first attempt on adapting the BNT for use in Indonesia involving healthy adult participants who predominantly represented population in Java Island where most of the inhabitants represent relatively wider variety with regard to education and other social backgrounds.

Results with regard to demographic characteristics and BNT scores are line with previous studies [5], [13]. It was found that age was negatively correlated with BNT scores, while education was positively correlated. These results imply that the years of education obtained by participants were associated with higher ability on picture naming, and that ageing was associated with lower ability on naming when ages are increasing. With regard to differences between females and males on BNT performance, there was no difference among the two categories of gender. This results was also in line with previous studies [11], [19].

6. Conclusions

It has been shown on Table 6 that the obtained norms of I-BNT is generally comparable with the obtained BNT norms of other countries. The reliability of the I-BNT was relatively higher than the USA-BNT and Belgium BNT (Table 6) which implies that there is no need to remove any of the 60 items from the I-BNT. Based on the correct responses analysis of the target words, we also decided to formulate the new order of the I-BNT (see Table 8). Nevertheless, it has been suggested that normative data should not be regarded as static state because normative data of any neuropsychological tests might have become outdated and no longer represent the population as people and their culture may change over time [20], [21]. Considering that the current study only include participants from the most-inhabited island in Indonesia, it is imperative to further this study and including participants who live in other islands in Indonesia.

7. Future Scope

Future research on the adaptation of the Indonesian BNT should take into account the effect of languages highly spoken at home as this factor might contribute to the scores obtained by the participants when the language used in the test is not the main language used by the participants in everyday life [22]. Roberts et al. even found that cultural factors were less important than bilingualism. In our study, the bi-language case might take the form of the fluency on using Indonesian language and participants' mother languages which highly depends on the frequency of usage. Another notion that should be taken into account when translating and adapting into other languages than the original English is the typical target words. Changes in target words may reflect changes in ecological background of the test items, however it might confuse clinical practitioners and researchers on both when placing the test items' gradation and when interpreting the performance of their clients on the test [23]. Criticism of BNT as a test for "naming ability" is that BNT may not capture the processes for a successful naming and does not sample widely enough from the content domain of "naming"[24].

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