Meaningfulness (m') values for 300 CCCs

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Normative values are given for the rated meaningfulness (m') of 300 consonant-consonant-consonant trigrams (CCCs). The CCCs were selected from the entire range of association values in Witmer (1935). Thus, they represent a greater range than Costantini and Blackwood's (1968) norms and are more current than the Witmer norms.

For some time, consonant-consonant-consonant trigrams (CCCs) have been used as stimulus material in learning and memory research. While several normative studies have been done on CCCs, only two have obtained meaningfulness or association values, Costantini and Blackwood (1968), Witmer (1935). Although each set of norms is useful, both have problems.

Witmer reported association values for 4,534 CCCs, each value being the percentage of 24 subjects who could either give an association to the CCC or state that he had an association without naming it. The two obvious problems with the Witmer norms are their age and the small number of select subjects, who were students and instructors (two) at Yale.

In addition, the Witmer (1935) norms do not take into account the differences in number of associations among subjects. A subject who had a large number of associations to an item would have the same effect on the norms as one who had only one association. Noble (1963) has presented arguments supporting the potential effectiveness of a measure reflecting the number of associations to an item as well as their simple presence or absence.

Costantini and Blackwood (1968) provided norms for Witmer items with 17% or less association value. They had 80 subjects rate each CCC on a 5-point scale for number of associations, ranging from none through average to very many, which allowed for better assessment of differing numbers of associations. A major shortcoming of the Costantini-Blackwood norms is the restricted set of items, 0% through 17% Witmer values. Possibly a worse problem is that most of the low association value CCCs contain a large preponderance of the same letters, severely limiting someone who wishes to minimize formal similarity among items selected.

There are also some ambiguities and inconsistencies about the Costantini-Blackwood norms. For example,

three items were listed twice, two with different values. Also, they report using the "343 trigrams having the lowest association values in Witmer's list [0% to 17%]," yet there are 454 Witmer items in that range. Finally, they report their results in association value terms (0%-20%, 21%-40%, etc.) without explaining how these can be appropriately derived from ordinal ratings.

The present study provides current norms for 300 CCCs selected from the entire Witmer range of values. The meaningfulness (m') values given here are derived from ordinal ratings of numbers of associations as in the Costantini-Blackwood norms but have been transformed into interval-scale values with Thurstone's method of successive intervals.

METHOD

Subjects

The subjects were 193 undergraduate students at the University of Tennessee at Chattanooga. They were members of classes whose instructors had agreed to make class time available.

Materials

Twelve or 13 CCCs were selected from the items for each association value in Witmer (1935), with the exception of 0% and 100% from which all items, 11 and 10, respectively, were taken. The total number of items was 300.

Within each association value, the choice of items was essentially arbitrary. However, an attempt was made to keep the number of items beginning with different letters approximately the same throughout the entire range. Ten different orders of the 300 items were created using a computer program with a pseudorandom number generator. Booklets were constructed from each order with 15 items per page, a 7-point rating scale appearing beside each item.

The instructions were given on a cover page. The subjects were told that they would be rating groups of three letters for the number of things or ideas associated with each. An example (BQJ) was given and the rating scale explained: 1 represented no associations at all; 2, a much below average number of associations; 3, below average; 4, average; 5, above average; 6, much above average; and 7, extremely many. The subjects were encouraged to use the entire range but not to be concerned about using one rating too often.

Procedure

The booklets were passed out to the subjects in such a manner that approximately equal numbers of subjects received each order of items and adjacently seated subjects got different orders. The author read the instructions aloud as the subjects

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followed silently, and answered questions before allowing the subjects to begin rating the items. The rating sessions took about 40 min.

RESULTS AND DISCUSSION

The ratings were transformed into interval-scale values for each item with a computer program (Hunt, 1975) based on the method of successive intervals. Following Noble (1961), the resulting values will be referred to as m' values. They are given in Table 1 in ascending order of m' and alphabetically within each value.

The standard deviations were also computed for each item (Hunt, 1975). These ranged from .69 to 1.16, with a mean of .91. The majority, 83%, were in the range .80 through .99. However, the investigator wishing to use standard deviations to compute confidence intervals, etc., might do better to use an estimate of one for each item, since the method of successive intervals assumes the unit-normal distribution as a measurement base, and the calculations would be made simpler. The effect of such conservative procedure should be innocuous compared to that of assuming too small a standard deviation, and thus too small a standard error.

The reliability of the m' values was assessed by dividing the subjects into two almost equal groups (86 and 87), again with a pseudorandom number generator, computing separate m' values for each group, and correlating the results. The product-moment correlation between the two sets of values was .96, indicating a very high degree of reliability.

The correlation between the m' values and Witmer's (1935) association values was also determined, the r being .82. While one would expect a positive correlation, this one is surprisingly high, indicating that the Witmer norms remain quite viable despite their shortcomings. However, considering the amount of independent variance between the two sets of values (33% , $1 - .82^2$) and the reliability of the m' values, it would, in most cases, probably be to an investigator's advantage to use the present norms.

Table 1
Meaningfulness Values (m') for CCCs

CCC	m'	CCC	m'	CCC	m'	CCC	m'	CCC	m'
XZF	1.39	LXT	1.72	QTD	1.96	RFP	2.14	WRP	2.44
ZXJ	1.40	XMP	1.72	BHJ	1.97	RWF	2.14	FTH	2.45
GZJ	1.44	BQZ	1.73	BZR	1.97	SLC	2.15	HLT	2.45
QXJ	1.44	FPW	1.73	FXT	1.97	TNP	2.15	TRK	2.45
XFQ	1.46	NLQ	1.74	HRC	1.97	MHW	2.16	LNT	2.46
XGQ	1.46	QBH	1.74	HTQ	1.97	HTD	2.17	SKD	2.46
XKH	1.46	WQB	1.74	PWJ	1.97	KFT	2.17	SNB	2.46
XQJ	1.46	GXM	1.75	FCL	1.98	FNT	2.18	WRN	2.47
ZMJ	1.47	CNZ	1.76	CMW	1.99	PLZ	2.18	BRM	2.48
ZQJ	1.47	SGQ	1.76	CMX	1.99	DSM	2.19	RMP	2.48
XBQ	1.49	BFX	1.77	KMC	1.99	LHS	2.19	SPM	2.48
ZJQ	1.50	JZR	1.77	LHJ	1.99	SFD	2.19	BNG	2.50
ZXQ	1.50	WMZ	1.77	PCW	1.99	DGM	2.20	TRD	2.51
ZJF	1.51	KQW	1.78	PKF	1.99	GDR	2.20	CHL	2.52
ZGJ	1.51	KSQ	1.78	KWN	2.00	JLT	2.20	DMP	2.52

Table 1 Continued

CCC	m'	CCC	m'	CCC	m'	CCC	m'	CCC	m'
ZQW	1.51	NZT	1.78	PCR	2.00	LZD	2.20	GRN	2.52
ZHJ	1.52	MTQ	1.79	WBJ	2.00	NFT	2.20	NSH	2.52
XBZ	1.53	SXK	1.80	JTG	2.01	ZNK	2.21	CRW	2.53
XJQ	1.53	DQJ	1.81	LGJ	2.01	GNR	2.22	HNT	2.55
QCG	1.54	HJQ	1.81	NHR	2.01	HNP	2.22	RNK	2.55
PZX	1.55	QNS	1.81	SFW	2.01	MRD	2.23	FRN	2.56
QJF	1.55	DJX	1.82	FFM	2.02	SFM	2.23	HRN	2.56
GQJ	1.57	FJL	1.82	HBJ	2.02	BDN	2.25	SHN	2.56
QCF	1.57	LQG	1.83	WPK	2.02	JNG	2.25	WDS	2.58
CXF	1.58	TQH	1.83	JPL	2.03	ZNC	2.25	WHP	2.60
FXQ	1.58	TQL	1.83	PBG	2.03	BDL	2.26	DPT	2.61
JXQ	1.58	GJD	1.84	BSX	2.04	WHZ	2.26	MSH	2.62
NQZ	1.58	PIX	1.84	MHB	2.04	FBL	2.27	SNK	2.62
ZTX	1.58	RBK	1.84	RHC	2.04	FSK	2.27	XMS	2.62
TZH	1.59	KTZ	1.85	SGW	2.04	LWR	2.27	DSH	2.63
ZCR	1.59	QSH	1.85	DJL	2.05	MKG	2.27	FND	2.64
CQJ	1.60	FPN	1.86	NBK	2.05	NSW	2.27	JCT	2.64
NJX	1.60	GXL	1.86	NBW	2.05	GTR	2.28	CLR	2.65
JQD	1.61	HKM	1.86	TCM	2.05	RFM	2.28	DRT	2.66
XMT	1.61	RJT	1.86	WKG	2.05	FKS	2.30	FRM	2.66
NZK	1.62	TKQ	1.86	JGL	2.06	MGJ	2.30	HLD	2.66
QHZ	1.63	DHJ	1.87	MBH	2.06	RMD	2.30	SLW	2.66
CJZ	1.64	JXS	1.87	JWC	2.07	TWK	2.30	PLN	2.67
DXZ	1.64	SBQ	1.87	TLN	2.07	SMF	2.31	TWN	2.68
GQK	1.64	TFJ	1.87	JSC	2.08	WLF	2.31	DNT	2.69
QNZ	1.65	DQN	1.89	LBG	2.08	HTR	2.32	CHP	2.71
XFK	1.65	ZTH	1.89	MWC	2.08	PKC	2.32	FLP	2.71
FCQ	1.66	CFP	1.90	NFJ	2.08	DRF	2.33	HRD	2.71
HJX	1.66	KWH	1.90	SCG	2.08	FMS	2.33	LJB	2.72
KQF	1.66	TXP	1.90	DLH	2.09	BJS	2.34	DWN	2.72
LJX	1.66	WRH	1.90	DLW	2.09	MGW	2.34	KNG	2.72
MZJ	1.67	GWC	1.91	GDY	2.09	GNT	2.35	DGS	2.74
PCZ	1.67	QNK	1.91	HCP	2.09	BMR	2.36	DRK	2.76
ZGW	1.67	DHW	1.92	LJD	2.09	RFT	2.36	LGS	2.77
ZHN	1.67	HFB	1.92	ZBR	2.09	RGN	2.36	SNW	2.77
CPZ	1.68	KMF	1.92	BRJ	2.10	CLF	2.37	SWM	2.78
KXH	1.68	KPR	1.92	WTK	2.10	LGT	2.37	PNK	2.79
ZBJ	1.68	CGN	1.93	JCF	2.11	DPL	2.38	BLD	2.80
RZC	1.69	TFH	1.93	JWB	2.11	HBR	2.38	BLT	2.83
WQL	1.69	NLC	1.94	MSQ	2.11	NHS	2.38	GLD	2.84
XRD	1.69	RLJ	1.94	MDJ	2.13	QLT	2.39	BRD	2.86
BWZ	1.70	CWT	1.95	TDN	2.13	JMS	2.41	BRN	2.87
LZC	1.70	RGP	1.95	WKM	2.13	MTG	2.42	LFT	2.89
NLZ	1.71	TLJ	1.95	GDB	2.14	SNF	2.42	PKG	2.95
CZT	1.72	WPF	1.95	PMG	2.14	GLW	2.43	THK	2.99

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