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Assessing the inter-method reliability and correlational validity of the Body Type Dictionary (BTD)

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Abstract

The political negotiation, erection and fall of national and cultural borders represents an issue that frequently occupies the media. Given the historical importance of boundaries as a marker of cultural identity, as well as their function to separate and unite people, the Body Type (BTD) (Wilson 2006) Dictionary represents a suitable computerized content analysis measure to analyse vocabulary qualified to measure body boundaries and their penetrability. Out of this context, this study aimed to assess the inter-method reliability of the Body Type Dictionary (BTD) (Wilson 2006) in relation to Fisher and Cleveland's (1956, 1958) manual scoring system for high and low barrier personalities. The results indicated that Fisher and Cleveland's manually coded barrier and penetration imagery scores showed an acceptable positive correlation with the computerised frequency counts of the BTD's coded barrier and penetration imagery scores, thereby indicating an inter-method reliability. In addition, barrier and penetration imagery correlated positively with primordial thought language in the picture response test, and narratives of everyday and dream memories, thereby indicating correlational validity.

1. Introduction

In human social relationships, proverbs such as *"Good fences make good neighbours"* convey the intricate and complicated negotiations between closeness and intimacy and between security and ownership (Mieder, 2003). In the political and cultural domains, the conceptualisation of boundaries represents an important issue that frequently occupies the media. There are many historical examples of regions that aimed to gain independence to develop geographical or cultural identities, such as Scotland from the UK, Flanders from Belgium, Catalonia from Spain and Bavaria from Germany. Frontiers are occasionally used to ward off negative influences. For example, the Israeli defence barrier, or fence, aims to protect Israeli citizens from Palestinian terrorism. The reinforcement of state boundaries represents a central concern in the debate about the regulation of the influx of immigration. Given that barriers tend to separate people, the opening of borders may unify previously separated regions. For example, the fall of the Berlin Wall marked the reunification of East and West Germany, which were cut off from one another for decades. The European Union was recently awarded the Nobel Peace Prize for politically merging European countries that had invaded each other's borders in both world wars.

Because of the political and cultural importance associated with the negotiation of national and regional boundaries, the Body Type Dictionary (BTD) (Wilson, 2006) provides a computerised content analysis measure that can be used to explore lexical content that is associated with boundaries and their penetrability. The BTD is a computerised version of Fisher and Cleveland's (1956, 1958) manual body image scoring system that assesses variation in individuals' body boundaries. Given the technical differences between manual and computerised scoring schemes, this study aimed to assess the inter-method reliability of the BTD to determine whether the lexical content of the computer-assisted BTD is equivalent to Fisher and Cleveland's manual scoring system. The secondary aim of this study was to explore the correlational validity of the BTD with regard to the frequencies of regressive imagery. After the reliability and validity are established, the BTD will provide a promising tool that can be used to explore body boundaries in written and spoken political texts.

1.1 Computerised versus manual coding

The advancement of computer technology has contributed to the development of sophisticated computer-assisted text analysis dictionaries, such as the Linguistic Inquiry and Word Count (LIWC) (Pennebaker, Francis & Booth, 2001) and the Regressive Imager Dictionary (RID) (Martindale 1975, 1990), that can be applied using content analysis software packages (e.g. Wordstat) (Péladeau, 1996). Most importantly, the application of these computer-assisted dictionaries has many advantages over manual scoring systems. As noted by various authors (e.g. Krippendorff, 2004; Neuendorf, 2002), the most obvious benefits are that a computerised scoring application is time efficient and provides an objective measure for assessing the linguistic content of a large text corpus. In contrast, manual scoring is often a very time consuming task and scorers must obtain an acceptable proficiency level in the scoring conventions to then conduct an equally time-consuming content annotation. Manual scoring is also prone to human error, such as omitting lexical items or phrases, whereas computerised methods reliably reproduce the same frequency of semantic content.

Yet, computerised content analysis methods have been criticised for not measuring up to the human ability to detect and understand associative meanings. Manual scorers are often able to identify linguistic meanings that are expressed through the textual context, whereas computerised content analysis systems often score individual lexical items and phrases without the ability to discern polysemy and understand the underlying associative meanings at the lexical and phrase levels because "meaning is often partly determined by context" (Viney, 1983, p. 558). Conversely, it has been demonstrated that computerised scoring of single lexical items, such as the General Inquirer, produce reliable results when disambiguating polysemous meanings by using classifying algorithms (Kelly and Stone, 1975; Rosenberg, Schnurr and Oxman, 1990).

Linguistic evidence has also shown an adequate convergence between from human-based context sensitive ratings and lexically-based computerised scoring. For example, Gottschalk and Gleser (1969) had human raters divide a text into phrases that were then coded based on context, themes, syntax and lexical content related to content classifications from psychological dimensions, such as anxiety. Subsequently, a computerised program, called Psychiatric Content Analysis and Diagnosis (PCAD) (Gottschalk and Gleser, 2002), was developed to measure anxiety and other psychiatric dimensions (see Gottschalk, 1995). The Dresdner Angstwörterbuch (DAW) (Berth, 2001; Berth and Suslow, 2001) is a German computerised measure that tags anxiety-related individual words and short phrases such as idioms, and it is a more reliable and valid measure than Gottschalk and Gleser's manual- and computer-assisted scoring of anxiety-related phrases.

1.2 Reliability and validity

The construction of a content analysis coding scheme typically involves the classification of lexical items that share a particular meaning into corresponding semantic content categories, which should measure a theoretical phenomenon (Weber, 1990, p. 12). Reliability is concerned with the empirical assessment of the stability and consistency of the lexical content and categories that measure such a phenomenon. Despite the importance of reliability assessments in content analysis research, reliability assessments of content analysis coding schemes have not received appropriate attention within the field of content analysis research (e.g. Krippendorff, 2004). Annotations based on an unreliable coding scheme produce invalid data that lack meaningful interpretations (e.g. Lombard, Snyder-Duch and Bracken, 2010). A content analysis scheme is perceived as reliable to the extent that the annotations of different coders, who code the same textual data using the same lexical classification scheme, produce the same results (Rourke, Anderson, Garrison and Archer, 2000). A high inter-coder agreement indicates a shared understanding of the lexical content and categories between coders, and thus implies stability within the content analysis scheme, as well as reproducibility (Rourke et al., 2000; Weber, 1990). A low inter-coder agreement, however, implies that there are internal errors, such as ambiguities and weaknesses in the lexical content, or extraneous errors, such as cognitive discrepancies between the coders, ambiguous coding instructions, insufficient training of the coders and weaknesses in the research methodology (Kolbe & Burnett, 1991; Weber, 1990).

Reliability refers to establishing the consistency of a content analysis scheme, whereas validity refers to establishing the extent to which the coding scheme accurately corresponds with the theoretical construct that it purports to measure (Stone, Dunphy and Ogilvie, 1969; Weber, 1990). A content analysis classification scheme has concurrent validity at the degree to which its findings correlate with measures obtained by other variables measuring a related phenomenon and the degree to which they are considered more valid than the assessed method (Krippendorff, 2004). Correlational validity is based on both convergent and discriminant validity (Campbell and Fiske, 1959). Convergent validity is based on the notion that a content analysis measure should have strong and positive correlation with the same or a theoretically related measure, whereas discriminant validity is based on the notion that a measure should correlate negatively and weakly with an unrelated measure (Krippendorff, 2004, pp. 320-321).

1.3 Fisher and Cleveland's Body Boundary concept

Fisher and Cleveland (1956, 1958) developed a body boundary scoring system that measures the frequency of lexical items that are assumed to relate to the definiteness and permeability of an individual's body boundaries. Barrier imagery measures the definiteness of body boundaries by emphasising the protective, enclosing, or concealing features of the boundaries of a definite structure and surface; for example, barrier responses may include *'a striped zebra'*, *'a woman wearing a high-necked dress'*, *'a tower with stone walls'*, *'a man smoking a pipe'* and *'a pregnant woman'*. In contrast, penetration imagery relates to the fragility, permeability, openness and destruction of definite boundaries; for example, penetration responses may include *'a man climbing though a window'*, *'an amputated arm'*, *'an open mouth'* and *'a bleeding leg'*. Based on this scoring system, a high frequency of boundary imagery corresponds to a high barrier personality, whereas a low frequency of barrier imagery indicates a low barrier personality. However, barrier and penetration imagery may represent related dimensions that measure different aspects associated to the body boundary construct compared to representing opposite ends of the same personality continuum. The theoretical concept supporting Fisher and Cleveland's body boundary imagery originated from their qualitative observations that individuals vary in appraisals of their own body image. An exploratory study that used projective personality tests to examine the behaviour patterns and fantasies of patients with rheumatoid arthritis confirmed their hypothesis (Fisher and Cleveland, 1956, 1958). An analysis showed that patients' verbal responses to the Rorschach inkblot test had a high frequency of references related to containing, protective and boundary defining qualities, which were attributed to the visual stimuli, such as *"knight in armour"*, *"turtle with a shell"* and *"cocoon"*. Fisher and Cleveland suggested that the arthritic patients were projecting their perceptions of their own body boundaries as having a hard shell that provides protection, which mirrors "a stiffness of body musculature which imparts a certain hardness and exterior stiffness to his appearance" (Fisher and Cleveland 1958, pp. 55).

A lack of protective functioning from body boundaries has also been identified as a common phenomenological feature of pathological and non-pathological altered states of consciousness (ASC). For example, individuals with schizophrenia report having psychotic delusions related to the permeability and inconsistency of their body boundaries, such as depersonalisations and denial of body parts (Guimón, 1997). With regard to non-pathological forms of ASC, hypnotised individuals have lower body boundary definiteness than individuals experiencing ordinary states of consciousness (Saraceni, Ruggeri and Filocamo, 1980) and individuals with higher scores on extra-sensory perception (ESP) have a lower body boundary definiteness than individuals with lower ESP scores (Schmeidler and LeShan, 1970). Changes in body boundary awareness have been explained in relation to heightened levels of regressive cognitive functioning in ASC. For example, Buck and Barden (1971) suggested that penetration imagery decreases in the expected direction of primordial to conceptual thought functioning in personal memory recall, which includes autobiographical reports, day dreams and dreams. Linguistic research employing computerised content analysis has identified that the frequency of penetration imagery correlates positively with primordial thought language in religious texts (Cariola, 2012a,b; Wilson, 2009).

Regressive cognitive functioning has been measured in computerised content analysis using the Regressive Imagery Dictionary (RID) (Martindale, 1975, 1990), which computes the frequency of lexical items associated with primordial and conceptual thought language (see Appendix 1). The concept of primordial and conceptual thought language relates to the Freudian theory differentiating between two modes of cognitive functioning, which are the primary (i.e. primordial) and secondary (i.e. conceptual) process. The primary process thought is concrete, irrational, free-associative, unrelated to logic, time and spatial constrains, and free from social and moral conventions. It is the principal awareness that young children have and it has been associated with the cognitive functioning of ASC, including dream, meditative, mystical and drug-induced hallucinatory states. The secondary process thought relates to the abstract principles of grammar and logic, time and space, social conventions and general knowledge of typical everyday situations in older children and adults.

Empirical research has demonstrated that both penetration and barrier imagery inflated with the level of regressive cognition (Cariola, forthcoming). This behaviour may be related to differential functions of body boundary imagery that are involved in free-associative responses to projective stimuli compared to language production when recalling personal memories. For example, Newbold (1984) theorised that individuals with weak body boundaries would project their bodily fragility onto barrier imagery lexical items, which would function as a compensatory protective structure in naturally occurring language. Thus, individuals with a weak bodily exterior would tend to direct their perceptual attention to objects with a strong bodily exterior (Haward, 1987). Similarly, Wilson (2006) stated that barrier imagery could be a compensatory function for the enduring feeling of uncertain regarding body boundary awareness that is associated with low barrier personality (cf., Popplestone's 1963 concept of an exoskeletal defence or Burris and Rempel's 2004 amoebic self theory), whereas penetration imagery could relate to context-dependent regressive cognitive functioning. The latter view resonates with Fisher's (1970) suggestion that the frequency of penetration imagery may depend on a number of variables associated with the testing situation.

Recent research has also explored Fisher and Cleveland's body boundary concept in relation to boundary awareness in sexual and violent offenders (Harry, 1987; Tardif & Van Gijseghem, 2001; Weinberg et al., 2003), abused girls (Leifer et al., 1991), body awareness therapy in abused women (Mattson et al., 1998), body boundary definiteness in children of divorced parents (Spigelman & Spieglman, 1991) and the relationship between body boundary awareness and organizing behaviour and experiences (Toshikazu & Isao, 2000).

1.4 Body Type Dictionary (BTD)

The BTD (Wilson, 2006) is a computer-assisted dictionary that measures the lexical frequencies of barrier and penetration imagery according to Fisher and Cleveland's (1956, 1958) manual scoring system. The BTD contains a total of 599 barrier imagery words, 252 penetration imagery words and 70 exception words that prevent the erroneous matching of ambiguous words stems (Wilson, 2009) (see Appendix 2)[1].

Based on the inherent technical differences between manual and computerised scoring, the lexical content of the BTD is more restricted than Fisher and Cleveland's manual scoring system. Specifically, the BTD excludes polysemous lexical items that cannot be unambiguously allocated to the barrier and penetration imagery categories, for example, *well* (adverb vs. reservoir for water) and expressions that contain barrier and penetration imagery due to conventional language use, such as shelled sea animals (given their relation to seafood dishes that do not contain the shell of the crustaceans, for example, *Lobster Bisque*). One of the greatest differences between the BTD and Fisher and Cleveland's manual scoring relates to the technical limitations of the BTD regarding the annotation of barrier and penetration related meanings in phrase-based lexical content. For example, manual coders using Fisher and Cleveland's scoring system would categorise the expression *badger run over* as penetration imagery, whereas BTD's computerised coding would not be able to decode the mental image of the destroyed animal and therefore would classify the lexical items in this expression as barrier imagery, not penetration imagery. The BTD was first used to compute the frequencies of barrier and penetration imagery in fictional rubber boots fetish narratives and modern romantic fiction narratives (Wilson 2006)[2]. The results indicated that the narratives for boot fetishes had a higher

[1] The original BTD (Wilson, 2006) contained a total of 551 barrier imagery words and 231 penetration imagery words. An inter-rater reliability study indicated that the original BTD lexical content could be slightly improved by adding more lexical items (Cariola, 2013).

[2] In this study, Wilson (2006) excluded the lexical items *boot(s)*, *Wellington(s)*, *welly/wellies*, and *mud* to control for increased lexical focus on boots in the rubber boot fetish narratives. In fact, the first version of Fisher and Cleveland's body boundary scoring system (1956) contained *clothing items with unusual covering and*

frequency of barrier imagery and a lower frequency of penetration imagery compared to the romantic narratives, which suggests a compensation for weak boundary differentiations and disconfirms Newbold's (1984) assumption that barrier and penetration imagery increase simultaneously.

1.5 Hypothesis

The BTD is theoretically based on Fisher and Cleveland's manual scoring system measuring body boundary imagery. Although empirical research supports the validity of the BTD's classification of semantic contents into barrier and penetration imagery, less is known about whether the BTD represents an acceptable computerised measure when compared to Fisher and Cleveland's scoring system. Therefore, the first part of the current study aims to assess the inter-coder reliability of the manual scores from Fisher and Cleveland's scoring system based on the coding of verbal responses to Rorschach inkblot stimuli. The second part of this study assesses the inter-method reliability of the BTD by comparing Fisher and Cleveland's manually coded Rorschach responses with computerised coding according to the BTD. Considering the theoretical relationship between body boundary imagery and regressive imagery, the third part of this study explores the strengths of the correlations between these factors across all of the experimental conditions, i.e. responses to the Rorschach inkblot test and picture response test, narratives of everyday memories and dream memories and dream interpretations. Based on the assumption that manual coding of barrier and penetration imagery using Fisher and Cleveland's manual scoring system should produce an acceptable level of inter-rater agreement, the first hypothesis (H1) of this study predicts that coded barrier and penetration imagery using Fisher and Cleveland's scoring system will be positively correlated with BTD computerised measures of the same linguistic variables, thereby indicating inter-method reliability. The second hypothesis (H2) is based on the assumption that primordial thought language increases proportionally in the direction expected for primordial to conceptual thought functioning across all of the experimental conditions in the full dataset, i.e. Rorschach inkblot test and picture response test, narratives of dream memories, narratives of everyday memories and dream interpretations. The third

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decorative function and only *buildings with unusual structures*, whereas the second edition (1958) included all types of *clothing items*, *vehicles*, and *buildings*.

hypothesis (H3) predicts that penetration imagery will be positively correlated with primordial thought language across all of the experimental conditions.

2. Method

2.1 Participants

Participants in this study were recruited from an e-mail that was sent to a number of academic departments within the majority of British universities and subsequently, the e-mail was distributed to the students. A total of 769 native British English speakers participated in this study, although 243 participants who provided incomplete or irrelevant responses were removed from the sample. In total, the responses of 526 participants (358 females, 168 males) aged between 17-64 years (M = 25.47, SD = 10.63) were used for further analysis based on a mixed sample size. Thus, 526 participants provided responses to the Rorschach inkblot test and picture response task, 488 participants provided a written narrative regarding an everyday memory, 450 participants provided a written narrative regarding a dream memory and 427 participants provided an interpretation of a recalled dream memory.

2.2 Experimental procedure

The online survey was produced with the web-based software Survey Monkey (http://www.surveymonkey.net). The study's online questionnaire included an initial briefing that outlined the purpose of the research project. Once participants decided to participate in the experiment, they disclosed their demographic information, including their gender, age and native language. Participants were then asked to write open-ended written responses to three types of experimental conditions, as follows: two types of projective tests (i.e. the Rorschach inkblot test and a picture response task), two types of memory recall tasks (i.e. an everyday memory recall and a dream recall) and a dream interpretation task. Completion of the experiment was not timed, and participants were informed that they could re-enter and complete their survey at any time. At the end of the experiment, participants were thanked and presented with a debriefing that explained the purpose of the study. The study obtained full ethical approval from the Ethics Committee at Lancaster University.

2.3 Stimuli

The following two different types of projective tests were used in this study: the Rorschach inkblot test (Rorschach, 1921) and a picture response task. The Rorschach inkblot test is a traditional projective test based on the presentation of ten symmetrically shaped inkblots. Seven inkblots are black-and-white and the remaining three inkblots are in colour. The picture response task used in this study, which is an alternative to the Thematic Apperception Test (TAT), was based on four photographs. The original TAT test (Murray & Morgan, 1935) typically presents a set of drawings that participants are asked to freely associate with a narrative that follows a classical Aristotelian narrative structure (i.e. a definite beginning, middle and end). For the purposes of this study, four pictures were selected that were related to the implied visual ambiguity of barrier and penetration imagery (see Figures 1-4 in Appendix 3). The pictures were selected according to their visual body boundary contents, which included barrier imagery (e.g. clothing items) and penetration imagery (e.g. bombarded houses). The pictures aimed to elicit freely associated narratives as a means to explore Fisher and Cleveland's assumption that individuals would project their own body boundary awareness onto external perceptions. Therefore, it was assumed that the narratives of high barrier personality types would reflect a heightened focus on body boundary imagery when compared to the narratives of low barrier personality types. All of the pictures were taken from the online photo management application http://www.flickr.com and were publicised with "no known restrictions on publication". Participants were presented with the Rorschach inkblot test and the picture response test on a computer screen and then asked to write a short interpretation of the inkblot and pictures in open-ended answer comment boxes.

2.4 Data

An assessment of inter-coder reliability and inter-method was based on 53 participants' open-ended responses to the Rorschach response task. This sub-sample represents a random selection from the full corpus (N = 526) and is based on the suggestion that an assessment of inter-coder reliability should ideally include at least 10% of the full sample size (Lacy and Riffle, 1996). The Rorschach responses from the sub-sample (N = 53) had a total text length of 8,618 words with a mean of 162.60 words per response (SD = 107.07).

An assessment of correlational validity was based on the full dataset (N = 526). The Rorschach responses (N = 526) had a total text length of 83,160 words with a mean of 158.10 words per response (SD = 96.43) and the picture response task had a text length of 277,997 words with a mean of 528.51 words per response (SD = 309.97). Narratives for everyday memories (N = 488) had a text length of 71,831 with a mean of 147.19 words per response (SD = 97.27) and narratives of dream memories (N = 450) had a text length of 62,005 with a mean of 137.79 words per response (SD = 125.16). Dream interpretations (N = 427) had a text length of 41,535 with a mean of 97.27 words per response (SD = 50.63).

2.5 Manual and computer-assisted coding of body boundary imagery

The lexical content and phrases from the sub-sample (N = 53) were manually coded using Fisher and Cleveland's body boundary coding scheme. Two coders, one male native-British English speaker and one male non-native British English speaker with a near-native proficiency, both of whom were undergraduate linguistics students, conducted the manual coding of the barrier and penetration imagery. Both coders were familiar with manual text annotation, the theoretical background for Fisher and Cleveland's body boundary concept and the semantic content of the body boundary scoring system prior to this study. For the purposes of this study, both coders were given hand-outs to re-familiarise themselves with the semantic content of Fisher and Cleveland's body boundary scoring system, as well as some examples of annotated Rorschach responses to illustrate the application of the barrier and penetration scoring criteria (e.g. Fisher, 1986, pp. 636-672).

For the coding, the coders were given a sub-sample of (N = 53) Rorschach responses to independently and manually annotate the lexical items and phrases that were classified as barrier and penetration imagery. The researcher and the coders agreed that a 2-week period was required to complete the annotation task. At the beginning of the process, the coders were not informed about the purpose and hypotheses of the study to reduce possible confounding biases, such as demand characteristics, that could impact the coding and, in turn, the validity of the results (Neuendorf, 2002, Orne, 1962). To counteract the tendency to comply with demand characteristics from the experimental situation, the coders were told that they should not determine the research hypothesis and the relevance of body boundary imagery within the framework of the research project (Rosenthal and Rosnow, 1984). Once the annotated Rorschach responses were returned to the researcher, both coders were thanked for their participation and debriefed about the experimental purpose of the study.

For the computerised coding using the BTD and RID, a slight overlap exists between the lexical items. In total, 5.34% (171) of the lexical content regarding body boundary imagery, i.e. 2.03% (65) of barrier imagery items and 3.31% (106) of penetration imagery items, was identical to the lexical content of the primordial thought language category. Due to this lexical replication, the overlapping lexis was excluded from the RID.

The BTD and the modified RID were applied to the texts using the PROTAN content analysis software program, which measures occurrences of category-based lexical content in texts (Hogenraad, Daubies and Bestgen, 1995; Hogenraad, Daubies, Bestgen and Mahau, 2003). A lemmatisation process was then applied to reduce words to their base forms. For example, *agrees, agreed* and *agreeing* were all reduced to *agree*. Next, the lexical content of the segmented and reduced texts was matched against the predefined categories of the BTD and modified RID. The PROTAN computes two raw counts for lexical occurrences. The density count shows how many distinct lexical items (i.e. types) match each dictionary category, whereas the frequency count represents how many lexical items in total (i.e. tokens) match the dictionary categories (Wilson 2008). For the purposes of this study, the frequency count measure was the most suitable for assessing inter-coder agreement given that the frequency count represents an equivalent to the coders' manual frequency count for barrier and penetration imagery, which facilitates statistical comparisons. PROTAN also produces a density and frequency rate that takes segment length into account. The inter-rater coder reliability used the raw frequency counts for barrier, penetration and sum body boundary imagery, whereas the inter-method reliability of the BTD was assessed using a frequency rate that was calculated based on the following formula:

Frequency rate = SQRT [(frequency count/ number of tokens in segment) x 1000]

2.6 Statistical analysis

Statistical calculations were performed with the statistical language and software of R (R Development Core Team 2011). Initial inter-coder agreement reliability assessed the agreement between the coders' annotations of the semantic items (Lombard et al. 2002). The inter-coder agreement was measured by calculating Krippendorffs's alpha (Krippendorff 2004) using the kripp.alpha {irr} function package (Garmer et al. 2012). Krippendorffs's alpha represents the preferred method for measuring inter-coder agreement of linguistic data that are not based on nominal measures (Passonneau 2006). The linguistic variables in this study were based on an ordinal measure. Krippendorff's alpha assumes that correlation coefficient values greater than $\alpha = .80$ are acceptable and values below $\alpha = .80$ up to $\alpha = .67$ only allow for tentative conclusions (Fleiss, 1981; Neundorf, 2002; Krippendorf, 2004).

All statistical calculations assessing the inter-method reliability and concurrent validity of the BTD were performed using the R:commander {Rcmdr} package (Fox, 2005). A Shapiro-Wilk test showed that the majority of the linguistic variables in the sub-sample (N = 53) and full dataset (N = 526) were not normally distributed. Therefore, a non-parametric two-tailed Spearman's rank correlation coefficient (Spearman, 1904) was used to assess the inter-method reliability and correlational validity as well as to provide additional evidence in the assessment of the inter-rater reliability of the body boundary imagery. A repeated measures Friedman test (Friedman, 1937) with a post-hoc Wilcoxon signed rank test was also applied to the data to compare the frequencies of barrier, penetration and sum body boundary imagery, as well as primordial and conceptual thought language between the experimental conditions.

3. Results

3.1 Inter-coder reliability

The descriptive statistics for Fisher and Cleveland's manually coded barrier and penetration imagery are presented in Table 1. A Krippendorff alpha inter-coder analysis indicated a moderate inter-coder agreement between coder 1 and coder 2 for barrier imagery $\alpha = .85$, penetration imagery $\alpha = .87$ and sum body boundary imagery $\alpha = .90$. An additional series of Spearman's rank correlation coefficients also identified positive correlations between coder 1 and coder 2 for barrier imagery, $\rho = .89$, $p < .001$, penetration imagery, $\rho = .87$, $p < .001$, and sum body boundary imagery, $\rho = .91$, $p < .001$. These acceptable inter-coder agreements indicates that both coders had a sufficiently similar understanding and ability to code the sub-sample of Rorschach responses in relation to Fisher and Cleveland's body boundary scoring system. Thus, they provided reliable body boundary coding to compare with the computerised coding of the body boundary imagery. The manually coded Rorschach responses can be used to assess the inter-method reliability between the computerised and manual scoring systems for body boundary imagery.

3.2 Inter-method reliability

This part of the study aimed to assess the inter-method reliability of the BTD and verify whether the computerised coding of context-independent body boundary lexis represents a sufficiently equivalent measure to the manual coding of Fisher and Cleveland's context-dependent body boundary scoring system.

Table 1 - Descriptive statistics for manual coding provided by coders 1 and 2, and computer-assisted coding of the body boundary imagery

N = 53	*Variable*	*Mean*	*Median*	*SD*	*IQR*[3]
Coder 1	*Barrier*	4.53	4.39	1.78	2.00
	Penetration	2.92	2.92	2.14	3.64
	Boundary sum	5.73	5.99	1.96	2.85
Coder 2	*Barrier*	4.81	4.90	2.31	2.36
	Penetration	2.82	3.07	2.17	4.51

[3] The abbreviation IQR stands for the Interquartile range, which indicates the statistical variability of the median value.

	Boundary sum	5.97	6.07	2.32	2.61
BTD	***Barrier***	4.82	5.02	1.97	2.55
	Penetration	2.43	2.70	2.04	4.21
	Boundary sum	5.75	5.78	2.01	2.68

Despite the acceptable inter-coder agreement, the descriptive statistics demonstrate that coder 1 noted less barrier and sum body boundary imagery, but slightly more penetration imagery than coder 2 (see Table 1). Such discrepancies in coding frequencies might be indicative of differences in the subjective interpretation of the body boundary concept, as well as random annotation omissions. Although the BTD used in this study has improved lexical content that includes an additional 48 barrier and 21 penetration imagery lexis compared to the original BTD, coding differences may have been related to the manual annotation of the body boundary lexis that were not included in the BTD. Both coders showed moderately high correlation coefficients between manually coded barrier, penetration and sum body boundary imagery. Despite these annotation differences, there was a moderate strength of association between individual coders and the computerised coding of the body boundary imagery, which reflects acceptable inter-coder agreement. Coder 1 showed consistently lower correlation coefficients than coder 2; however, the correlation coefficients remained moderately high between the individual manually coded barrier, penetration and sum body boundary imagery and the computerised lexis (see Table 2). The correlation coefficients between the manually and computerised coded lexis were also moderately high when the manually coded variables were collapsed (see Table 3). However, manual penetration imagery had a weaker correlation with the computerised penetration lexis when compared to the correlations between manual barrier and sum body boundary imagery and the computerised barrier and sum body boundary lexis. The results indicate that the computerised coding of the body boundary lexis represent a good equivalent to the manual coding of Fisher and Cleveland's body boundary scoring system, with the exception that the BTD is better at identifying barrier imagery than penetration imagery. Therefore, the first hypothesis (H1) was confirmed.

Table 2 - Spearman's rank correlation coefficients for manual coding provided by coders 1 and 2, and the computerised coding of the body boundary imagery

	Coder 1	***Coder 2***

Barrier	***Coder 1***	-	
	Coder 2	.825**	-
	BTD	.822**	.844**
Penetration	***Coder 1***	-	
	Coder 2	.835**	-
	BTD	.672**	.743**
Sum boundary	***Coder 1***	-	
	Coder 2	.893**	-
	BTD	.840**	.864**

Notes: * **$p < .05$ level,** ** **$p < .01$ level**

Table 3 - Spearman's rank correlation coefficients for the manual and computerised coding of the body boundary imagery

		Manual/BTD
Barrier	***1. Manual***	-
	2. BTD	.871**
Penetration	***1. Manual***	-
	2. BTD	.735**
Sum boundary	***1. Manual***	-
	2. BTD	.879**

Notes: * **$p < .05$ level,** ** **$p < .01$ level**

3.3 Correlational validity

This part of the study aimed to assess the correlational validity of penetration imagery to establish whether it correlates positively with primordial thought language, as suggested by empirical research (Buck and Barden, 1971; Cariola, 2012a,b; Wilson, 2009). Descriptive statistics indicate that barrier and penetration imagery, as well as primordial thought language, were most evident in the Rorschach responses and lowest in dream interpretations, whereas conceptual thought language was highest in dream interpretations and lowest in Rorschach responses (see Tables 4 and 5).

Table 4 - Descriptive statistics for the body boundary imagery across all of the experimental conditions

		Mean	***Median***	***SD***	***IQR***
Rorschach (N = 526)	***Barrier***	5.22	5.17	1.90	2.22
	Penetration	2.83	3.06	2.07	4.18
	Sum body boundary	6.30	6.30	1.85	2.29
Picture response (N = 526)	***Barrier***	4.32	4.33	1.15	1.47
	Penetration	1.98	2.12	1.11	1.26
	Sum body boundary	4.89	4.88	1.10	1.44
Everyday (N = 488)	***Barrier***	2.20	2.43	2.18	3.69
	Penetration	1.43	.00	1.92	2.86
	Sum body boundary	3.11	3.28	2.37	4.81

Dream (N = 450)	*Barrier*	3.31	3.75	2.45	5.01
	Penetration	1.45	.00	1.95	2.95
	Sum body boundary	4.00	4.41	2.59	3.15
Dream interpretation (N = 427)	*Barrier*	1.69	.00	2.17	3.63
	Penetration	.74	.00	1.47	.00
	Sum body boundary	2.21	2.37	2.32	4.24

Table 5 - Descriptive statistics for the regressive imagery across all of the experimental conditions

		Mean	*Median*	*SD*	*IQR*
Rorschach (N = 526)	*Primordial thought*	13.72	13.86	1.82	2.37
	Conceptual thought	5.26	5.48	2.09	2.18
Picture response (N = 526)	*Primordial thought*	9.28	9.24	1.29	1.66
	Conceptual thought	8.71	8.80	.99	1.22
Everyday (N = 488)	*Primordial thought*	8.24	8.34	2.30	2.67
	Conceptual thought	9.38	9.45	2.02	2.59
Dream (N = 450)	*Primordial thought*	9.73	9.66	2.21	3.05
	Conceptual thought	8.62	8.66	1.87	2.36
Dream interpretation (N = 427)	*Primordial thought*	8.10	8.37	2.48	2.90
	Conceptual thought	10.04	10.00	1.92	2.29

A Friedman test indicated a significant difference in the frequencies of body boundary and regressive imagery across the response types, $p < .001$. A post-hoc analysis with a pair-wise Wilcoxon signed-rank test identified the directions of the significant differences for regressive imagery and body boundary imagery across the experimental conditions (see Tables 6 and 7). The results indicated that barrier and penetration imagery were significantly greater in the Rorschach responses and the picture response task when compared to narratives of everyday memories, narratives of dream memories and dream interpretations. However, there were no significant differences between narratives of everyday memories and narratives of dream memories for penetration imagery.

Similar to barrier and penetration imagery, the results indicated that primordial thought language was significantly greater in the Rorschach responses and the picture response task when compared to narratives of everyday memories, narratives of dream memories and dream interpretations. Primordial thought language did not differ substantially between the picture response task and narratives of dream memories and between narratives of everyday memories and dream interpretations. Conceptual thought language showed the reverse trend when compared to primordial thought language. Thus, dream interpretations and narratives of everyday memories had significantly higher frequencies of conceptual thought language when compared to the Rorschach responses, the picture response task and narratives of dream memories, but there were no significant differences for this factor between the picture response task and narratives of dream memories. Although narratives of dream memories had a slightly higher yet insignificant frequency of primordial thought language when compared to the picture response task, the increase in primordial thought language across conditions behaves in the expected direction of primordial to conceptual thought language, and thus supports the second hypothesis (H2). Similar to the proportional increase in primordial thought language and barrier and penetration imagery from the Rorschach responses to dream interpretations, conceptual thought language was most evident in dream interpretations and lowest in the Rorschach responses. This finding suggests a proportional decrease in conceptual thought language in the expected direction of primordial to conceptual thought.

Table 6 - Wilcoxon signed-rank test results for body boundary imagery between the experimental conditions

	Comparison	Sig. level
Barrier imagery	Rorschach > Picture response > Dreams > Everyday > Dream interpretation	**
Penetration imagery	Rorschach > Picture response > [Dreams = Everyday] > Dream interpretation	**
Sum boundary imagery	Rorschach > [Picture response = Dreams] > Everyday > Dream interpretation	**

Notes: * p < .05 level, ** p < .01 level

Table 7 - Wilcoxon signed-rank test results for regressive imagery between the experimental conditions

	Comparison	Sig. level
Primordial	Rorschach > Dreams > Picture response > Everyday > Dream interpretation	**
Conceptual	Dream interpretation > Everyday > [Dreams = Picture response] > Rorschach	**

Notes: * p < .05 level, ** p < .01 level

Furthermore, a Spearman's rank correlation coefficient matrix indicated a consistent positive correlation between penetration imagery and primordial thought language across all of the experimental conditions (except for Rorschach responses and dream interpretations). This finding reflects a convergent validity regarding penetration imagery and primordial thought language that is partly consistent with the third hypothesis (H3). In particular, these results provide some indication that penetration imagery and primordial thought language represents related cognitive processes, as demonstrated in the polynomial regression (Cariola, 2012a; West, 1991; Wilson, 2009) and static correlation analysis of Christian religious texts (Cariola, 2012b). In contrast, penetration imagery was negatively correlated with conceptual thought language in the majority of experimental conditions (except for Rorschach responses and dream interpretations), which indicates discriminant validity. The results also showed that barrier and penetration imagery were not significantly correlated (except for narratives of dream memories), which provides some evidence that barrier and penetration imagery represent independent dimensions as opposed to polar opposite ends of a body boundary continuum (Fisher, 1956, 1958).

Table 8 – Spearman's rank correlation coefficients for body boundary imagery and regressive imagery between the experimental conditions

Experimental condition	Linguistic variable	1.	2.	3.
Rorschach (N = 526)	**1. Primordial thought**	-		
	2. Conceptual thought	-.351**	-	
	3. Barrier imagery	.011	-.202**	-
	4. Penetration imagery	-.003	-.010	-.014
Picture response test (N = 526)	**1. Primordial thought**	-		
	2. Conceptual thought	-.188**	-	
	3. Barrier imagery	.258**	-.164**	-
	4. Penetration imagery	.243**	-.191**	.016
Everyday narratives (N = 488)	**1. Primordial thought**	-		
	2. Conceptual thought	-.434**	-	
	3. Barrier imagery	.251**	-.241**	-
	4. Penetration imagery	.203**	-.119**	.058
Dream narratives (N = 450)	**1. Primordial thought**	-		
	2. Conceptual thought	-.337**	-	
	3. Barrier imagery	.104*	-.226**	-
	4. Penetration imagery	.232**	-.202**	.185**
Dream interpretations (N = 427)	**1. Primordial thought**	-		
	2. Conceptual thought	-.186**	-	
	3. Barrier imagery	.115*	-.110*	-
	4. Penetration imagery	.009	-.012	.073

Notes: * p < .05 level, ** p < .01 level

Moreover, results indicated that barrier imagery was positively correlated with primordial thought language in most of the conditions, except in Rorschach responses. Conversely, there was a consistent negative correlation between barrier imagery and conceptual thought language across all of the experimental conditions. Taking into consideration that barrier imagery was only positively correlated with penetration imagery in the narratives of dream memories, barrier imagery may not represent a polar opposite to penetration imagery. These results suggest then that barrier imagery reflects a dimension that has a different function than penetration imagery which is however related to regressive cognition, and thereby indicating that barrier and penetration imagery represent interrelated processes. The independent and context-dependent functions of barrier and penetration imagery in relation to primordial and conceptual thought language need to be explored in more detail, which moves beyond the realm of the current study.

4. Discussion and conclusion

The results of this study showed that the BTD represents a reliable computer-assisted content analysis scheme for quantitatively measuring the frequencies of barrier and penetration imagery in a text. Both coders produced sufficient inter-coder agreement with regard to the manually coded barrier and penetration lexis and phrases. The first experiment yielded a sufficient inter-method reliability between the manually coded Rorschach responses and the computerised coding based on the same dataset. In this sense, the BTD represents a reliable computerised measurement of lexical content classified as barrier and penetration imagery with regard to Fisher and Cleveland's original manual scoring system of the body boundary lexis and phrases.

Despite the acceptable level of inter-coder agreement for barrier, penetration and sum body boundary imagery between the coders, the first experiment indicated that one coder had a lower correlation coefficient compared to the second scorer regarding the coding of penetration imagery. However, the collapsed manually coded variables indicated an acceptable level of reliability for barrier, penetration and sum body boundary imagery. In particular, the discrepancy in the correlation coefficients between the manual and computerised coding schemes highlights the inherent difficulties associated with manual coding, including differences in the subjective understanding of the content, insufficient experience and low proficiency levels of the coder. Manual coding is typically time-consuming and coders may experience concentration problems and fatigue when annotating a larger text. This may increase the propensity for human error in the scoring process, such as omitting lexical items or phrases. In contrast, the mechanical process of computerised coding has a greater consistency and thus results in a reliable measurement of the lexical content. Although manual coding provides better validity due to its context-sensitive coding of lexis and phrases compared to lexically based computerised scoring (Deffner, 1986), the moderate correlation coefficients between the manual and computerised coding systems for barrier and penetration imagery indicate that the BTD's tagging of context-independent singular lexical items produced a reliable measurement of body boundary imagery when compared to the context-dependent coding of phrases and lexis based on the discriminative cognitive functioning and linguistic sensitivity of the human coders.

The second experiment explored the correlational validity of the BTD in relation to primordial thought language as measured by the RID. As expected, the results indicated that regressive imagery increased in the expected direction of primordial thought to conceptual thought across all of the experimental conditions, whereas conceptual thought reflected the reverse trend in relation to primordial regression. Similarly, barrier and penetration imagery showed an increase in the same direction as primordial to conceptual thought functioning. The correlation matrix also showed that barrier and penetration imagery were moderately positively correlated with primordial thought and negatively correlated with conceptual thought language across the majority of the experimental conditions.

These results lend empirical support to the Freudian idea that primordial thought cognition predominates in freely associated thinking and dreaming states (Buck & Barden 1971; Freud 1900) and provide empirical evidence that typical everyday awareness and conscious reasoning may reflect a distinctively different mode of cognitive thought when compared to dreaming states and freely associated thinking, which are involved in the interpretations of projective stimuli. Drawing on a psychodynamic theoretical framework, individuals project their unconscious material onto the free-associative stimulus, such as the inkblot and onto the so-called dream screen in dreaming states (Lewin, 1946). This focus on the internal projective screen might facilitate the projection of one's own body boundaries onto the depicted projective test stimuli (Fisher, 1958). Simultaneously, heightened primordial cognitive functioning lowers defence mechanisms, which then increases the flow of unconscious thought material entering conscious awareness (Freud, 1900). This lowering of defence mechanisms and greater permeability between unconscious and conscious thought awareness might be reflected in an increased frequency of penetration imagery. Barrier imagery also proportionally increases in the direction of primordial to conceptual thought functioning, which suggests that barrier imagery only functions as an compensatory function to differentiate the self from the other, as hypothesised by Wilson (2009, p. 13), and thus serving to provide a dichotomous classification, such as differentiating between “real” and “imaginary” or “internal” and “external”. Considering that both barrier and penetration imagery might be moderated by regressive cognition levels, it may be that barrier and penetration imagery increase simultaneously but that this increase is not only related to an individual’s need to compensate for a weak body boundary as a personality trait; it may be that the individual’s weakening of body barriers is also associated with context-dependent regressive functioning (Newbold, 1984; Haward, 1987). This context-dependent variable related to body boundary awareness has been demonstrated in previous body boundary experiments. For example, the administration of psychotropic drugs, which typically increase primordial functioning (Martindale and Fisher, 1977; West, Martindale, Hines and Roth, 1983), increased the frequency of barrier imagery (McGlothin et al., 1967), whereas hypnosis increased the frequency of penetration imagery (Freundlich and Fisher, 1974).

Empirical evidence suggests that regressive cognition levels may be related to affective and individual differences. For example, results from a cognitive categorisation test measuring attributional and relational similarities that mapped onto primordial and conceptual thought principles showed a simultaneous increase in primordial process categorisation and levels of anxiety in anxious individuals (Brakel and Shevrin, 2005; Kleinman and Russ, 1988), which confirms the Freudian psychoanalytic assumption that overwhelming anxiety leads to an increase in primordial process activity as a regressive defence mechanism (Freud, 1926). One of the most consistent findings suggests that creative individuals, particularly men, have controlled access to primordial cognition and score higher on adaptive regression and defensive effectiveness than less creative individuals (Kris 1952; Holt 2002). A positive relation between creativity and thought suppression (Merkelbach, Horselenberg and Muris, 2001) has been identified that might be related to dissociations regarding trauma experiences (Van den Hout et al., 1996; Muris and Merckelbach, 1997). Hence, the interaction of individual differences and differences in life histories may represent a complex dynamic system that interacts with the overall cognitive and affective organisation of text production to a similar extent as it interacts with the encoding and recall processes of autobiographical memories.

Thus, the results of this study provide empirical evidence that body boundary awareness may be also dependent on the level of dedifferentiation as opposed to being a stable personality trait, as suggested by Fisher and Cleveland. Although Rorschach responses had the highest levels of primordial regressions, primordial thought language did not show a positive correlation with penetration imagery nor barrier imagery. This lack of a correlation may be related to the relatively short text sizes of the Rorschach responses, which limit the occurrence of thematically diverse vocabulary items, when compared to the other experimental conditions that resulted in greater text sizes. The dream interpretations had the lowest level of regressive cognition, such that low frequencies of primordial thought language and penetration imagery may have caused the lack of a correlation between these variables.

Overall, the results of this study confirmed the research hypotheses and indicated that the BTD provides an acceptable level of inter-method reliability in relation to Fisher and Cleveland's manual scoring system. Moreover, body boundary imagery indicated correlational validity with regressive imagery.

Future research can explore the relationship between body boundary awareness and primordial thought language in relation to structured texts, such as literary works, as compared to the experimental approach employed in this study using unstructured texts, such as free-associative responses and autobiographical memories. In addition, the results of this study indicate that the BTD can be safely applied to the analysis of body boundaries and their penetrability in political spoken and written texts. In addition, given that the body represents a central element in human lives, future research can also identify the relationship between emotions as well as existential themes, including illness, death and ageing, in relation to the body boundary concept. Moreover, Martindale (1990) applied the RID to literary texts to explore the concept of creativity. To contrast the present study's experimental approach using unstructured texts, such as free-associative responses and autobiographical memories, future research can explore the relationship between body boundary awareness and primordial language in relation to structured texts, such as literary works.

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Appendices

Appendix 1

Semantic categories and examples of barrier and penetration imagery from the BTD (Wilson 2006), including all clothing items, vehicles and buildings

Barrier imagery	**Examples of semantic items**
Clothing items	*Dress, robe, costume*
Animals with distinctive or unusual skins, including shelled creatures	*Alligator, badger, peacock, snails, shrimp*
Enclosed openings in the earth	*Valley, ravine, canal*
Unusual animal containers	*Bloated, kangaroo, pregnant*
Overhanging or protective surfaces	*Umbrella, dome, shield*
Armoured objects or objects dependent on their own walls	*Armour, battleship, ship*
Things being covered, surrounded or concealed	*Covered, hidden, behind*
Buildings	*Bungalow, cathedral, tower (except buildings that relate to social institutions, e.g. church, hospital, school.*
Enclosed vehicles	*Car, ship, truck*
Things with unusual container-like shapes or properties	*Bagpipes, chair, throne*
Unique structures	*Tent, fort, hut*
Miscellaneous barrier words	*Basket, bubble, cage*
Penetration imagery	
Reference to the mouth being opened or used for intake or expulsion	*Eating, tongue, yawning*
Reference to evading, bypassing or penetrating through the exterior of an object	*Autopsy, fluoroscope, x-ray*
References to the body wall being broken, fractured, injured or damaged, including degeneration of surfaces	*Bleeding, stabbed, wounded, withered*
Openings in the earth that have no set boundaries	*Abyss, fountain, geyser*
All openings	*Anus, doorway, entrance*
Things that are insubstantial and without palpable boundaries	*Ghost, mud, shadow*
Transparency	*Crystal, see-through, transparent*
Miscellaneous penetration words	*Broken, frayed, hole*

Appendix 2

Semantic categories and examples of primary and secondary process language in the RID (Martindale, 1975, 1990)

PRIMARY PROCESS LANGUAGE	**Examples of semantic items**
Drive	
Oral	*Breast, drink, lip*
Anal	*Sweat, rot, dirty*
Sex	*Lover, kiss, naked*
Sensation	
General sensation	*Fair, charm, beauty*
Touch	*Touch, thick, stroke*
Taste	*Sweet, taste, bitter*
Odour	*Breath, perfume, scent*
Sound	*Hear, voice, sound*
Vision	*See, light, look*
Cold	*Cold, winter, snow*
Hard	*Rock, stone, hard*
Soft	*Soft, gentle, tender*
Defensive symbolisation	
Passivity	*Die, lie, bed*
Voyage	*Wander, desert, beyond*
Random movement	*Wave, roll, spread*
Diffusion	*Shade, shadow, cloud*
Chaos	*Wild, crowd, ruin*
Regressive cognition	
Unknown	*Secret, strange, unknown*
Timelessness	*Eternal, forever, immortal*
Conscious alteration	*Dream, sleep, wake*
Brink-passage	*Road, wall, door*
Narcissism	*Eye, heart, hand*
Concreteness	*At, where, over*
Icarian imagery	
Ascend	*Rise, fly, throw*
Height	*Up, sky, high*
Descend	*Fall, drop, sink*
Depth	*Down, deep, beneath*
Fire	*Sun, fire, flame*
Water	*Sea, water, stream*
SECONDARY PROCESS LANGUAGE	
Abstraction	*Know, may, thought*
Social behaviour	*Say, tell, call*
Instrumental behaviour	*Make, find, work*
Restraint	*Must, stop, bind*
Order	*Simple, measure, array*
Temporal references	*When, now, then*
Moral imperatives	*Should, right, virtue*

Emotions	
Positive affect	*Cheerful, enjoy, fun*
Anxiety	*Afraid, fear, phobic*
Sadness	*Depression, dissatisfied, lonely*
Aggression	*Angry, harsh, sarcasm*
Expressive behaviour	*Art, dance, sing*
Glory	*Admirable, hero, royal*

Appendix 3

Figure 1 – *Picture 1 from the picture response test*

http://www.flickr.com/photos/powerhouse_museum/3640355880/

Figure 2 – *Picture 2 from the picture response test*

http://www.flickr.com/photos/osucommons/5139906857/

Figure 3 – *Picture 4 from the picture response test*

http://www.flickr.com/photos/statelibraryofnsw/3294694544/

Figure 4 – Picture 4 from the picture response test

http://www.flickr.com/photos/statelibraryqueensland/4292454948/