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Concepts of 'self' in delusion resolution

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The concept of 'self' has a pivotal role in psychotic symptoms (Conrad, 1958), but its utility in the treatment process has been limited. Since perceptions of 'self' – and of 'others' – change as symptoms evolve and resolve (Parnas and Handest, 2003), if appropriately assayed this concept provides a unique entry-point through which the congruity between delusions and illness can be examined. The potential clinical value of this cannot be overstated as delusions are frequently associated with poor clinical outcomes and enormous emotional distress (Leifker et al., 2009), which is often not remedied by treatment (Haddock et al., 1998).

Employing a visual 'mapping' technique we examined how delusions of the 'self' affected one patient's social world, and how delusional content and sense of 'selves' augmented in parallel during recovery. The resulting maps rendered visible the connections between delusions and concepts of the 'self' that are usually concealed intentionally or due to lack of insight. Such maps can provide information concerning the origins of emotional distress, and require less time to obtain than dialogue based approaches (Hermans, 2001).

The patient was a 24 year-old female diagnosed with paranoid schizophrenia, stable and undergoing treatment for her first acute relapse. Her participation was in accordance with the Declaration of Helsinki and University of Hong Kong ethical guidelines. She presented with marked persecutory delusions, was distressed about not understanding her psychotic experiences, and was 'high functioning' (based on education, employment history, and strong professional and social networks). Her distrust of people centered on two clinically established beliefs: 1) the Independent Commission Against Corruption (ICAC) – a Hong Kong government policing agency – was investigating her; and 2) her boss (*boss #1*) had been murdered.

The patient verbally identified the individuals and roles of herself of most importance in her life (e.g., *myself as a friend*), totaling 18 persons. For each person ('self' or 'other'), the patient generated one descriptive feature (e.g., *capable*). From these responses, we constructed a matrix with one row per person and one column per feature. Every cell in the 18 by 18 matrix was filled with a 0 or 1 based on the patient's ratings indicating whether each person either did (1) or did not (0) posses each feature (e.g., myself as a friend *is not* capable). The resulting matrix of 0's and 1's was entered into a hierarchical classification (HICLAS) analysis program, which is a quantitative approach that can be employed to create visual maps, in this case of the internal structure of delusions (see Boeck and Rosenberg, 1988 for details). HICLAS works by simultaneously computing the hierarchical associations between the individuals and their distinctive features, which are input as binary ratings. The HICLAS analysis program then linked clusters of individuals to corresponding features that were similarly hierarchically bundled, as illustrated in Fig. 1 (Boeck and Rosenberg, 1988). As a hierarchical model, HICLAS requires a balance between the dimensionality, which determines the number of levels, and goodness-of-fit, which quantifies how well the statistical model fits the raw data. Rank, which is the number of hierarchical levels allowed in the model, quantified dimensionality. Jaccard goodness-of-fit coefficients quantified the goodness-of-fit for each element and for the overall model (Table 1). Based upon goodness-of-fit and dimensional interpretability, a rank 3 model was examined to explore the nature and connection between 'self' and others (overall Jaccard's goodness-of-fit = 0.73).

The resulting 'maps' from the initial ratings, when the patient's false beliefs were prominent and the ratings 53 days later when delusions were resolving are displayed in Fig. 1. The calculations showed the distinctive changes in ratings over time. At the initial time point (Fig. 1a), the patient denied that her delusions were abnormal. By questioning her specifically about the characteristics of individuals without allowing elaboration, we were able to uncover connections between selves and others that the patient either was not aware of or willing to share. For example, her conflicting feelings toward those actively involved in her treatment were revealed. Furthermore, her 'selves' were isolated, corresponding to her withdrawing from others. While 'selves', family, and clinic workers were associated with positive and negative features, 'others' in the workplace were defined by overwhelmingly negative descriptors, likely due to her belief that they were involved in the (delusional) murder of *boss #1*.

Importantly, HICLAS mappings showed distinctive changes in ratings over time. At the final evaluation, symptoms had subsided and there was a partial reconciliation of the various roles of 'self' (e.g., *me as daughter* grouping with *mother*) (Fig. 1b). She trusted clinic workers and no longer associated them with ICAC, which was reflected in their prominent positions in the hierarchy attached to influential features. However, her coworkers retained primarily negative features which could be explained by the persistence of her belief that *boss #1* had been murdered.

The maps highlight the patient's changing concept of 'self'. A change in the patient's perspectives of 'self' and 'others' was concordant with her understanding of her delusions, and highlights the link between the 'self', symptoms and changes in the content of (false) beliefs (Dean et al., 2009). However, although the patient no longer explicitly endorsed any of her delusions at the final evaluation, she still struggled in the

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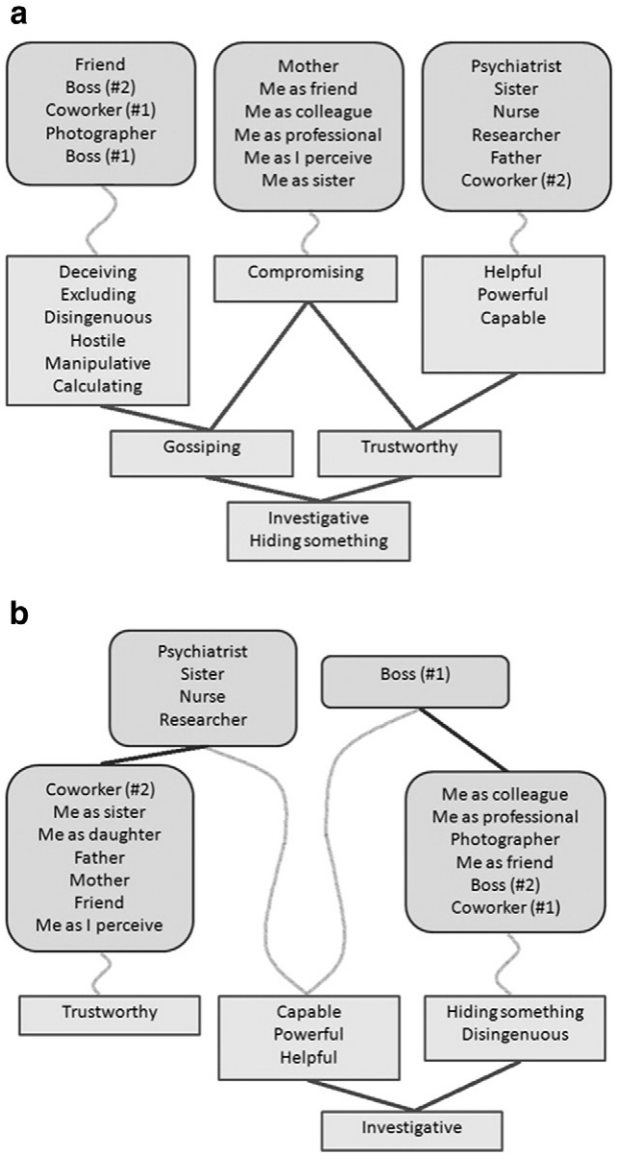

Fig. 1. HICLAS visual mappings of the patient's self-concept. Wavy lines represent connections between persons, on the top of each diagram, and features, on the bottom. Straight lines represent connections between bundles. Connections indicate that features were endorsed by the patient. For example, 'mother' was reported as compromising, gossiping, trustworthy, and investigative at first assessment, and as not deceiving or helpful. (a) At first assessment 'selves' were generally separate from 'others,' which segregated according to the context of the patient's interactions with individuals. Coworkers were associated with negative features that could be linked to the (delusional) murder of her boss. (b) At the final assessment this model adopted more hierarchical levels and more 'self' clusters. Clinic workers and the subordinate bundle of persons assumed primarily positive, prominent features corresponding to delusional resolution. Workplace persons and *boss #1* retained negative features which may reflect the persistent (delusional) belief that *boss #1* was murdered, a fact unstated in clinical sessions.

Table 1
HICLAS Jaccard index goodness-of-fit measures for individual persons and features. The overall model had a 0.73 goodness-of-fit for rank three (meaning three levels were allowed within the model) at both assessment points. Bundle pattern reflects the groupings persons and features in Fig. 1. In each model, some persons or feature were placed in the null class, meaning they did not have connections to other people or features and were excluded from the hierarchical bundles (represented by '000').

		First assessment		Final assessment	
		Goodness-of-fit	Bundle pattern	Goodness-of-fit	Bundle pattern
Persons	Boss (#1)	0.64	100	0.83	011
	Boss (#2)	0.82	100	0.43	001
	Coworker (#1)	0.69	100	0.33	001
	Coworker (#2)	0.5	001	1	100
	Father	0.67	001	1	100
	Friend	0.89	100	0.5	100
	Me as daughter	0	000	0.5	100
	Me as colleague	0.71	010	1	001
	Me as friend	0.83	010	0.5	001
	Me as I perceive	0.63	010	0.33	100
	Me as professional	0.67	010	1	001
	Me as sister	0.5	010	0.5	100
	Mother	1	010	0.5	100
	Nurse	1	001	1	110
	Photographer	0.67	100	0.75	001
	Psychiatrist	1	001	1	110
	Researcher	0.83	001	1	110
	Sister	1	001	1	110
Features	Aggressive	0	000	0	000
	Calculating	0.5	100	0	000
	Capable	0.5	001	1	010
	Compromising	1	010	0	000
	Deceiving	0.83	100	0	000
	Disingenuous	0.71	100	0.71	001
	Excluding	0.8	100	0	000
	Helpful	0.86	001	0.67	010
	Gossiping	0.92	110	0	000
	Hiding something	0.94	111	1	001
	Hostile	0.6	100	0	000
	Investigative	0.94	111	0.92	011
	Manipulative	0.6	100	0	000
	Powerful	0.5	001	0.8	010
	Trustworthy	0.77	011	0.69	100
	Vengeful	0	000	0	000

workplace. Thus, regardless of her ability to express this, HICLAS uncovered the persistence of negative features surrounding her delusion of *boss #1's* murder, likely because fewer features defined these persons (De Bonis et al., 1994). Since multiple levels within the self structure represent a more complex, integrated and psychologically 'healthy self' (Gara et al., 1989) it is noteworthy that the patient's roles of 'self' became more integrated during recovery. HICLAS affords a visualization based on quantitative assessments of self-concept. Crucially it can be used as a tool with which to formulate a more complete picture of a patient's social landscape, without requiring a full narrative statement. Here we present this approach as a tool with which it is possible to examine the relationship between delusions, self-concept, and therapeutic outcome. In summary, this quantification and cartography of the phenomenology of the critical role of 'self' in delusion formation provides a framework for an experimental neuro-psychiatric study of the 'self' and its fundamental role in delusions.

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Conflicts of Interest

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