Clinical aphasiology and cognitive neurpsychology: A pragmatic alliance. Commentary on Laine and Martin, "Cognitive Neuropsychjology has been, is, and will be significant to aphasiology"

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Clinical aphasiologists embraced CNP models soon after CNP emerged as a discipline in the 1970s, recognising the limitations on which the models were based while simultaneously valuing their contribution to clinical diagnosis and treatment, and building on these limitations through refining the methodology and approaches to address them. Driven by an obligation to look for a theoretical underpinning and rationale for their work in order to maximise treatment gains, clinicians heeded Basso's (2003) words, 'What is done should always be the best that can be done with reference to current knowledge. The more knowledge we have, the better we should do, but we cannot wait for the ultimate truth to act' (p. 263). Laine and Martin (L&M) appropriately draw out the positive ways in which CNP has enhanced clinical aphasiology but it is L&M's attention to the therapeutic process that we want to tease out more here. As L&M highlight, it has often been stated that CNP can shed little light on *how* therapy works; while we may be better off for knowing where to focus attention and how to manipulate therapy tasks, the mechanisms remain unclear. The therapeutic process, however, with respect to both diagnosis and intervention in aphasia, is a complex beast where impaired physical and psychological processes interact with a person's unique set of environmental, physiological and personal characteristics and communicative needs, intertwined with contextual and societal factors. If CNP is to be judged by its inability to inform the therapy process on all fronts then, along with all other disciplines contributing to this process, it will never fare well. However, adopted in full cogniscence of the developmental nature of CNP and its inherent shortcomings, a pragmatic alliance has developed between CNP and clinical aphasiology that build on the features addressed in more detail by L&M.

CORNERSTONES OF THE ALLIANCE

L&M rightly raise a number of important contributions made by CNP to the clinical understanding of aphasia. Perhaps highest on the list is the fine-grained theory driven examination of language and cognitive processing. Through the identification of an individual's strengths and weaknesses, a CNP approach facilitates an indepth understanding of the nature of the person's difficulties and possible targets for treatment, a crucial starting point whatever the subsequent approach to intervention. 'Box and arrow models' that have been widely but unfairly criticised for not considering the computations performed, have a real advantage over all other existing theoretical approaches in that they can provide detailed theoretically-driven understanding of the relationship between performance in different tasks, and allow a clinician to use this converging evidence to identify a client's underlying impairments. The clinical availability of assessments, notably the PALPA (Kay, Lesser & Coltheart, 1992) and the PAL (Caplan & Bub, 1990), and increased understanding by clinicians of the hypothesis testing approach (Whitworth, Webster & Howard, 2005) has ensured this diagnostic process is clinically feasible. There are time constraints associated with the clinical setting that may make this problematic but the availability of shorter assessments, notably the CAT (Swinburn, Porter & Howard, 2005), allow screening of the language system with the same systematic evaluation of performance across tasks and different types of stimuli in a much quicker format.

L&M further suggest that the refinement of the single case research design has been fuelled by CNP and has had a dramatic impact on both our understanding of and intervention in aphasia; we whole-heartedly agree with this. L&M highlight a number of key developments in designing treatment efficacy studies, including specificity in defining deficits, provision of standard background information, attention to stimulus selection, systematic manipulation of stimuli, tasks and their presentation, consideration of confounding factors, and the use of statistical evaluation of results, each crucial to enabling the reliable interpretation of therapy outcomes. The specification of the content and form of therapy in sufficient detail within intervention studies underpinned by CNP has also facilitated replication and, as a consequence, clinicians are in a better position to use published approaches with greater understanding of what may work for a particular individual, with the potential to analyse and explore differences between individuals. Case series studies have formalised this replication with standard assessment and therapy procedures across a group of clients, serving to confirm or refute what is seen in individuals and enabling individual differences to be studied. Case

series studies grounded in a CNP approach have, for example, provided strong evidence that therapy can be effective in improving/restoring impaired skills such as word retrieval (Conroy, Sage & Lambon-Ralph, 2009a, 2009b; Fillingham, Sage & Lambon Ralph, 2006; Hickin, Best, Herbert, Howard & Osbourne, 2002). Such studies have also served to increase our understanding of a variety of issues, such as the impact of the underlying difficulty on outcome, e.g. the limited gains in word retrieval for people with a semantic impairment compared to those with a difficulty in accessing phonological representations (Hickin et al., 2002), the impact of co-occurring memory and executive problem solving difficulties on therapy outcome (Lambon Ralph, Snell, Fillingham, Conroy & Sage, 2010) , the impact of the overall severity of the naming impairment (Conroy et al., 2009b), the differential responsiveness of nouns and verbs to therapy (Conroy et al., 2009a, 2009b) and the impact of client preferences, motivation and communicative need on the response to writing therapy (Beeson, Rising, & Volk, 2003). That some studies have shown no significant difference between responses to contrasting therapies for word retrieval, e.g. phonological versus orthographic cueing (Hickin et al., 2002), errorful versus errorless learning (Conroy et al., 2009b; Fillingham et al., 2006) or decreasing versus increasing cues (Conroy et al., 2009a), is equally important in understanding and planning intervention. The importance of case series is reinforced here in their capacity to reveal that certain contrasts are not relevant to all clients undergoing the same intervention, an insight that is often masked within group studies, and usually not revealed in single subject designs. On a practical note, the need to ensure that theoretically motivated therapy materials that systematically vary task/stimulus characteristics are as readily available to clinicians as assessment resources is also important. The accessibility of resources will then facilitate greater systematic comparison of treatment approaches (see http://research.ncl.ac.uk/aphasia/resources.html for example).

RECIPROCITY: THE ULTIMATE ALLIANCE

A key point, however, raised by L&M, and offered as a marker for the future, is the contribution CNP has made to understanding and fine-tuning the therapy process, where both the client and the science are beneficiaries. In many cases, for example, the understanding of normal language processing can directly influence the choice of therapy tasks with the aim of reactivating or restoring impaired function, the outcome in turn increasing our understanding of the nature of the component processes. For example, the contrasting responses of people with aphasia to therapy targeting orthographic-to-phonological conversion (Berndt & Mitchum, 1994; De Partz, 1986; Nickels, 1992) promoted better understanding of the

component processes of graphemic parsing, blending and phonological assembly and led to the introduction of therapies combining these (e.g. Yampolsky & Waters, 2002). Examination of therapy outcomes can provide additional evidence for the functional dependency of associated processes as the effects of therapy generalise to untreated tasks. Such direct insights gained from therapy outomes in developing our understanding of the models themselves are indeed frequent (see Nickels, Kohnen & Bierdermann, 2010, for an enlightened discussion). Nickels et al (2010) highlight the significant contribution of the reciprocal, but often neglected, relationship between theory and therapy, citing examples of where both a priori predictions and post hoc interpretations from therapy studies have served to inform our understanding of cognitive theory.

Returning to the notion of the theory informing therapy, in other cases, CNP models can provide a framework for choosing therapy tasks which will provide a cogntive relay or alternative way of achieving impaired function, e.g. use of self-generated phonemic cues to activate spoken representations of words via access to orthographic representations (Nickels, 1992). The choice of therapy in these cases relies on a very clear understanding of the individual's strengths and the relationship between impaired and retained processes; in the example above, therapy is unlikely to be successful if the person's written naming or, minimally, access to initial letters of words, is more impaired than spoken naming and if the person does not respond well to phonemic cues. Attention to therapy outcomes has further highlighted instances where the precise choice of task is less critical, such as in spoken naming where all tasks involve many components of the 'whole process' and stimulate, for example, both semantic and phonological processing (Howard, 2000). This is as significant a contribution as one that highlights one approach over another. Therefore, through combining rigorous experimental design with examination of therapy outcomes, CNP can contribute to unpacking intervention, enabling us to measure whether targeted therapy alters specific language functions in ways that were anticipated, whether different therapy approaches result in different outcomes for the same behaviours, and whether altering the dosage and timeliness of therapy adjusts the gains made in therapy. As studies using CNP will usually hypothesise *why* therapy would work, the considered use of measures to explicitly test these hypotheses places therapy under the microscope by gathering the evidence to support or refute these, affording a unique opportunity to fairly test the therapy used.

While L&M highlight the unpacking of the processes within the models as a key challenge, if CNP is to continue to have relevance for clinical aphasiologists, a number of other issues also present to the clinician – and offer real opportunity to advance aphasia therapy. Consideration of dosage and timeliness of therapy present further challenges to the clinician but also perhaps highlight where CNP is best placed to help address these. Whilst some studies have shown gains in naming following non-intensive training (once weekly therapy for eight weeks) (Hickin et al., 2002), there is increasing evidence that to produce change in a person's communication, either by the reactivation of impaired function or the teaching of a strategy, often requires intensive and long-term training (De Partz, 1986; Luzzatti, Colombo, Frustaci, & Vitolo, 2000). For some people, intensive clinical input may be available. For other people, studies have investigated acheiving this intensity via self-directed home practice (e.g. Beeson, 1999) or computer training, possibly with remote monitoring of performance via email or the phone (e.g. Friedman & Lott, 2000). The successful implementation of these approaches requires both a sound understanding of how therapy may be achieved for an individual and how its impact can be measured. A final challenge relates to the broader debate regarding the relationship between statistical significance of change following therapy derived from CNP and the real life effects for the person with aphasia. While some recent studies have begun to address this issue, for example, with consideration of the relationship between change on naming tasks and word retrieval in conversation (Herbert, Hickin, Howard, Osbourne, & Best, 2008) and impact of targeted language intervention on participation and self esteem (Best, Greenwood, Grassly, & Hickin, 2008), this remains a significant challenge if CNP is to continue to inform clinical management of aphasia. One likely direction here will be through rigorous attention to sentence and discourse models in planning, implementing and measuring therapy outcomes, seeking ways in which CNP may interface with these other levels of language to maximise and extend the benefits of intervention to real life communication.

CONCLUSION

We would therefore take little exception to the view that CNP is not a panaceer, and nor should it operate in isolation from other fields seeking to understand human behaviour. The promises of computational modelling discussed by L&M, combined with theories of learning and social interaction, are critical in progressing our understanding of behaviour change and disruption to cognitive and linguistic processes. We will always need to draw on a wide range of theoretical and social frameworks to inform the therapeutic process and, where people elect to focus on their language difficulties, CNP can significantly inform the selection of

goals and therapy protocols, even if intervention as a whole includes many other facets, e.g. modification of the communication environment and/or training of communication partners. The application of CNP must continue to be both rigorous and ambitious while continuing to be as pragmatic as it has to date. In a parallel argument, Dell (2004), when reflecting on computational models within CNP offered the argument that, "They have much to offer cognitive neuropsychology, once we get past both our fears that the models are flawed and our beliefs that they are flawless" (p. 29). The same is said here for our acceptance of CNP in clinical aphasiology – clinicians intervene within the full context of the individual and operate on many fronts with a developing knowledge and evidence base. It is crucial here that we do not throw the baby out with the bathwater but continue this fruitful alliance.

REFERENCES

Basso, A. (2003). *Aphasia and its therapy*. Oxford: Oxford University Press.

Beeson, P. (1999). Treating acquired writing impairment: strengthening graphemic representations. *Aphasiology, 13*(9-11), 767-785.

Beeson, P., Rising, K., & Volk, J. (2003). Writing treatment for severe aphasia: Who benefits? *Journal of Speech, Language and Hearing Research, 46*, 1038-1060.

Berndt, R. S., & Mitchum, C. C. (1994). Approaches to the rehabilitation of "phonological assembly": elaborating the model of non-lexical reading. In G. Humphreys & M. J. Riddoch (Eds.), *Cognitive Neuropsychology and Cognitive Rehabilitation*. London: Lawrence Erlbaum Associates.

Best, W., Greenwood, A., Grassly, J., & Hickin, J. (2008). Bridging the gap: can impairment based therapy for anomia have an impact at the psychosocial level? *International Journal of Language & Communication Disorders, 43*(4), 390-407.

Caplan, D., & Bub, D.N. (1990). Psycholinguistic assessment of aphasia. Paper presented at the meeting of the American Speech and Hearing Association Conference, Seattle, WA.

Conroy, P., Sage, K., & Lambon-Ralph, M. A. (2009a). The effects of decreasing and increasing cue therapy on improving naming speed and accuracy for verbs and nouns in aphasia. *Aphasiology, 23*(6), 707-730.

Conroy, P., Sage, K., & Lambon-Ralph, M. A. (2009b). Errorless and errorful therapy for verb and noun naming in aphasia. *Aphasiology, 23*(11), 1311-1337.

Dell, G.S. (2004) Connectionism and cognitive neuropsychology: Comments on Harley's reflections. *Cognitive Neuropsychology, 21*(1), 27-30.

De Partz, M. P. (1986). Re-education of a deep dyslexic patient: rationale of the method and results. *Cognitive Neuropsychology, 3*, 149-177.

Fillingham, J. K., Sage, K., & Lambon Ralph, M. A. L. (2006). The treatment of anomia using errorless learning. *Neuropsychological Rehabilitation, 16*(2), 129-154.

Friedman, R. B., & Lott, S. N. (2000). Rapid word identification in pure alexia is lexical but not semantic. . *Brain and Language, 72*, 219-237.

Herbert, R., Hickin, J., Howard, D., Osbourne, F., & Best, W. (2008). Do picture-naming tests provide a valid assessment of lexical retrieval in converation in aphasia? *Aphasiology, 22*(2), 184-203.

Hickin, J., Best, W., Herbert, R., Howard, D., & Osbourne, F. (2002). Phonological therapy for word-finding difficulties: A re-evaluation. *Aphasiology, 16*, 981-999.

Howard, D. (2000). Cognitive neuropsychology and aphasia therapy: the case of word retrieval. In I. Papathanasiou (Ed.), *Acquired neurogenic communication disorders.* London: Whurr Publishers.

Kay, J., Lesser, R. and Coltheart, M. (1992) *PALPA: Psycholinguistic Assessments of Language Processing in Aphasia*. Hove: Lawrence Erlbaum Associates.

Lambon Ralph, M.A., Snell, C., Fillingham, J.K, Conroy, P., & Sage, K. (2010). Predicting the outcome of anomia therapy for people with aphasia post CVA: Both language and cognitive status are key predictors. *Neuropsychological Rehabilitation*, 20, 289-305.

Luzzatti, C., Colombo, C., Frustaci, M., & Vitolo, F. (2000). Rehabilitation of spelling along the sub-word-level routine. *Neuropsychological Rehabilitation, 10*(3), 249-278.

Nickels, L. (1992). The autocue? Self generated phonemic cues in the treatment of a disorder of reading and naming. *Cognitive Neuropsychology, 9*, 155-182.

Nickels, L., Kohnen, S., & Biedermann, B. (2010). An untapped resource: Treatment as a tool for revealing the nature of cognitive processes. *Cognitive Neuropsychology*, 27(7), 539-562.

Swinburn, K., Porter, G., & Howard, D. (2005). *The Comprehensive Aphasia Test*. Hove, UK: Psychology Press.

Yampolsky, S., & Waters, G. (2002). Treatment of single word oral reading in an individual with deep dyslexia. *Aphasiology, 16*(4-6), 455-471.