

## Short Report

Evidence in the literature supports a number of interventions that occupational therapists may utilise when working with people with apraxia, although there is no gold standard approach. A large-scale survey (n = 304, 36% response rate) was conducted with the membership of the College of Occupational Therapists Specialist Section – Neurological Practice to explore therapists' understanding of apraxia and to provide a benchmark of current practice. Consensus was found in the majority of belief statements regarding the condition, although the respondents were unclear about the relationship between cognition and apraxia. When the therapists were asked to indicate their choice and use of interventions for apraxia, the results showed that the main consideration was the context in which a person performs activities, with moderate use of specific techniques including errorless learning and chaining. The results are related to the evidence base and the implications for occupational therapy practice and education are discussed.

# Exploring Evidence-Based Practice by Occupational Therapists when Working with People with Apraxia

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## Introduction

### Understanding apraxia

Apraxia is the absence of the ability to perform volitional movement. The most cited definition is from Geschwind (1975), who reported that the apraxias may be defined as disorders of the execution of learned movement in the absence of weakness, incoordination, sensory loss, incomprehension or inattention to commands. Roy (1996) postulated that the praxis network is a complex interface between sensory, cognitive and motor processes. By acknowledging the role of sensory and cognitive skills, this helps to clarify that the performance of a volitional movement requires more than the physical capabilities of the muscles.

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There is no definitive model for apraxia, although a model outlining the stages of processing and the different gesture types has been developed by Roy and Square (1994), as outlined by Roy (1996). Three different systems are identified for performing volitional movement: the sensory/perceptual system (information coming in); the conceptual system (the idea and the analysis of the information); and the production system (the motor output). In addition, there are different types of gesture: transitive gestures, which involve tools (for example, using a hairbrush), and intransitive gestures, which are sociocultural (for example, waving hello). Gestures can be pantomimed (generated from memory), for example, 'Show me how you would use a toothbrush', or performed by imitation. Delayed imitation involves one person performing a gesture and another person imitating it afterwards, utilising the working memory. Concurrent imitation does not require memory skills and involves performing a gesture at the same time as another person. Intransitive and transitive gestures are processed in different ways and a person with apraxia may have difficulty with one but not with the other. There may also be differences in the ability to pantomime or imitate gestures.

It has been suggested that there is a difference between apraxia and dyspraxia. The latter is a disorder of new learning of motor patterns and sequences and is more suited to describing neurodevelopmental disorders,

for example, children who have difficulty in acquiring praxis skills. In contrast, apraxia is a disorder of learned movement and occurs in adults with acquired neurological disorders, tending to affect the stages of conceptualising (the idea stage) or producing (motor stage) volitional movement (Ayres 1985, Poole 2000). There is no consensus on this distinction, but the clinical implication for occupational therapists working with people with apraxia following an acquired brain injury is that previously learnt knowledge and praxis ability may be utilised within rehabilitation, for example, by the use of mental imagery (Grieve and Gnanasekaran, in press). One of the aims of this survey was to discover how occupational therapists in the United Kingdom understood the terminology of this impairment.

### Evidence for intervention

Goldenberg and Hagmann (1998) stated that occupational therapists often view apraxia as a major obstacle to independent functioning, yet there is a paucity of studies examining the treatment of apraxia (Hanna-Pladdy et al 2003). However, a few studies have been conducted that advocate various treatment techniques. Strategy training involves teaching compensatory strategies and the available evidence indicates that this approach is more effective than usual occupational therapy, although the long-term effects need further exploration (Donkervoort et al 2001, Geusgens et al 2006).

Longer-term effectiveness has been demonstrated by Goldenberg et al (2001) when comparing exploration training (that is, trial and error) with direct training. The latter approach involved participants carrying out the entire activity with verbal, imitation (copying the therapist) or physical facilitatory support. Direct training led to a significant reduction in the number of errors and the assistance required, and the training effects were largely preserved at the 3-month follow-up. However, the therapeutic gains were restricted to the specific activity restored; in contrast, the transfer of skills is anticipated with strategy training and further research is planned in this area (Geusgens et al 2006).

Single case studies have also provided some insight into intervention. Wilson (1988) and Butler (1997) provided detailed accounts of task-specific training, using activity analysis, chaining techniques and the practice of specific activities, to achieve greater functional performance. Although limited to a single case study design, both studies demonstrate that task-specific learning is possible for people with apraxia.

One further consideration for intervention is the role of the environment. Mather and Ochipa (1997) suggested the use of pragmatic treatment approaches within the person's natural environment, enabling contextual cues to assist with the initiation of action.

Guidelines for intervention with people with apraxia are available, based upon clinical experience (Jackson 1999, Edmans et al 2001). Specific treatments include the use of normal movement, activities in context and error

recognition. All techniques can be guided by clinical reasoning and an understanding of the praxis network (Jackson 1999). However, the literature to date has not explored either occupational therapists' understanding of apraxia or the interventions used in clinical practice.

### Aims of the study

The authors both now work in higher education and therefore have a common interest in learning and teaching. At the time of this study, the first author worked as a clinical specialist occupational therapist in neuroscience and stroke. Discussions with colleagues and her clinical experience mirrored the literature by suggesting both a need for further education on apraxia and the need to explore the range of intervention strategies being used in clinical practice. Therefore, there were two aims for this study:

1. To explore occupational therapists' understanding of apraxia to guide the content for postgraduate teaching
2. To provide a benchmark of current occupational therapy interventions when working with people with apraxia.

### Method

Ethical approval for this study was obtained from the School of Health Sciences and Social Care Research Ethics Committee, Brunel University. The National Executive Committee of the College of Occupational Therapists Specialist Section – Neurological Practice gave permission to send questionnaires to all occupational therapists on the database. In practice, this involved the researcher providing the materials (questionnaire, stamped addressed envelope and participant information sheet) to the administrator, who addressed and sent the questionnaires, in order to maintain database confidentiality. The final sample for the survey was 850 occupational therapists and the data were collated at the end of 2004. Consent was assumed by the return of the questionnaire, with no follow-up for non-returners.

The questionnaire was piloted twice before being sent in a single mailing. It was in four sections: A, demographic information; B, the understanding of apraxia; C, the assessment of apraxia; and D, the treatment of apraxia.<sup>1</sup>

Section B presented a list of 'belief statements' and the respondents were asked to rate their level of agreement with each statement, which formed the basis to rate understanding. The range of responses was strongly agree, agree, neither agree nor disagree, disagree and strongly disagree.

Section D presented a list of possible intervention strategies and asked the respondents to indicate whether or not they used them when working with people with apraxia. There was an additional space for 'other' strategies and any strategies noted in this space were treated as discrete data entries when analysed. The list was originally devised from the evidence in the literature, clinical experience and the feedback from the pilot groups.

<sup>1</sup>A copy of the questionnaire is available from the lead researcher.

**Table 1. Consensus status for each belief statement on section B of the questionnaire**

Belief statement	Chi <sup>2</sup> obt (probability)	Consensus status
B1) I believe that dyspraxia and apraxia are the same thing.....	1.43 (NS).....	No consensus.....
B2) I believe that dyspraxia is due to sensory problems.....	49.5 (p < 0.001).....	Consensus disagreement.....
B3) I believe that dyspraxia is due to communication impairments.....	76.8 (p < 0.001).....	Consensus disagreement.....
B4) I believe that there are different types of dyspraxia.....	86.1 (p < 0.001).....	Consensus agreement.....
B5) I believe that dressing dyspraxia is an individual impairment.....	26.1 (p < 0.001).....	Consensus disagreement.....
B6) I believe that dyspraxia is a problem with motor planning.....	91.8 (p < 0.001).....	Consensus agreement.....
B7) I believe that dyspraxia is due to a cognitive problem.....	6.29 (NS).....	No consensus.....
B8) I believe that dyspraxia is untreatable.....	81.9 (p < 0.001).....	Consensus disagreement.....
B9) I believe that dyspraxia is due to motor impairments.....	45.5 (p < 0.001).....	Consensus disagreement.....
B10) I believe that analysing a person's performance errors is the best way to assess dyspraxia.....	71.9 (p < 0.001).....	Consensus agreement.....
B11) I believe that dyspraxia can result from left or right hemisphere damage.....	54.7 (p < 0.001).....	Consensus agreement.....
B12) I believe that it is best to address dyspraxia with compensatory rehabilitation.....	16.9 (p < 0.001).....	Consensus disagreement.....

The pilot groups also recommended other changes. First, it was reported that the term 'strategy training' was unclear; this was therefore changed and became 'I believe it is best to address dyspraxia with compensatory rehabilitation' as the twelfth belief statement. It was also decided that the term 'dyspraxia' would be used within the wording of the questionnaire because the pilot groups felt that this was in prevalent use by occupational therapists at the time. Therefore, the belief statement 'I believe that dyspraxia and apraxia are the same thing' was also added.

### Description of respondents

Three hundred and four (36%) of the members completed and returned the questionnaire. Of these, 95% were female and 4% were male (1% data missing), with an average age of 36 years and 8 months (range 22 years and 2 months to 62 years and 6 months). There was not an even distribution of experience because 59% of the respondents were working as senior I occupational therapists. There was, however, a good spread for therapists' experience of working with people with neurological impairments. The mean time was 7 years and 2 months, with a range of 0-28 years' experience.

## Results

The responses to the belief statements are presented in Table 1 and consensus was reached on 10 of the 12 belief statements. Consensus status was obtained by collapsing the extreme categories of agreement and disagreement and analysing the numbers using chi-square goodness of fit. Neutral responses were subtracted from the overall total when calculating the chi-square statistic. A criterion value of  $p < 0.001$  was set when making judgements about whether consensus was found for any belief statement. Table 2 is a summary of the respondents' consensus beliefs.

Section D of the survey asked respondents about their approach to intervention (see Table 3).

**Table 2. Summary of therapists' beliefs on apraxia**

Occupational therapists responding to this survey <b>agree</b> that:	<ul style="list-style-type: none"> <li>- There are different types of apraxia</li> <li>- Apraxia is a problem with motor planning</li> <li>- Analysing a person's performance errors is the best way to assess apraxia</li> <li>- Apraxia can result from left or right hemisphere damage</li> </ul>
Occupational therapists responding to this survey <b>disagree</b> that:	<ul style="list-style-type: none"> <li>- Apraxia is due to sensory problems</li> <li>- Apraxia is due to communication problems</li> <li>- Dressing apraxia is an individual impairment</li> <li>- Apraxia is untreatable</li> <li>- Apraxia is due to motor impairments</li> <li>- It is best to address apraxia with compensatory rehabilitation</li> </ul>
Occupational therapists responding to this survey <b>do not have a consensus belief</b> regarding:	<ul style="list-style-type: none"> <li>- Dyspraxia and apraxia are the same thing</li> <li>- Apraxia is due to a cognitive problem</li> </ul>

**Table 3. Interventions used by respondents (n = 304)**

Treatment technique	Percentage of respondents using it in practice
Activities in context.....	87 (n = 228).....
Familiar environment.....	77 (n = 202).....
Appropriate time of day for the given activity.....	77 (n = 202).....
Non-verbal cues.....	77 (n = 202).....
Verbal cues.....	74 (n = 194).....
Backward chaining.....	64 (n = 168).....
Errorless learning.....	61 (n = 160).....
Normal movement approach.....	58 (n = 151).....
Hand-over-hand modelling.....	56 (n = 147).....
Upper limb facilitation.....	53 (n = 139).....
Forward chaining.....	52 (n = 136).....
Copying gestures.....	46 (n = 121).....
Visual imagery technique.....	30 (n = 79).....
Other methods (combined).....	19 (n = 50).....
Practice and repetition.....	10 (n = 26).....

## Discussion

### Understanding apraxia

Geschwind's (1975) definition outlined what apraxia was not and there was consensus agreement from the respondents that apraxia was not a sensory, communication or motor impairment. However, consensus was not reached on the cognitive nature of the impairment, although the respondents were in agreement that it was a problem with motor planning. Therefore, current understanding does not appear to mirror the conceptual framework outlined by Roy (1996) and further education may be beneficial in this area to enhance understanding.

Despite the distinction made by Ayres (1985) and Poole (2000), the respondents did not know if apraxia and dyspraxia were different impairments. However, there is no consensus agreement on this issue in clinical practice so this finding is not altogether surprising.

### Intervention

The techniques mostly used (75% or above) were context-based, that is, using the familiar environment, activities in context and the appropriate time of day. Although there is little empirical evidence to support this, the literature advocates the need for more research in this area (Mather and Ochipa 1997) and guidelines based on clinical experience also support this approach (Edmans et al 2001). It was interesting to note, however, that 74% of the respondents used verbal cues, because this is not supported by the evidence and, given the high correlation between apraxia and aphasia, may not be appropriate.

There was moderate use (45% to 65%) of specific techniques, including physical facilitation, errorless learning, chaining and copying gestures. These techniques are all supported in the available literature and further education may be warranted to raise the awareness of the techniques further. The challenge when interpreting these findings is that experience from clinical practice indicates that errorless learning, hand-over-hand facilitation and utilising normal movement principles have the same premise, that is, to prevent a person from making mistakes in order to improve performance in function despite the persistence of apraxia. Therefore, it may have been misleading to separate them within this study. Nonetheless, the findings show a moderate use of strategies that seek to prevent errors in function and this is supported by the evidence for direct training (Donkervoort et al 2001).

In contrast, the respondents reached consensus opinion that compensatory rehabilitation was not the best way to approach intervention for people with apraxia. Although the literature did support the concept of strategy training at the time of the study (Van Heugten et al 1998), research is ongoing in this area (Geusgens et al 2006) and may not have been transferred to clinical practice at the time of the questionnaire in 2004.

### Limitations of the study

Occupational therapists focus on activities and not on individual impairments. Therefore, a survey asking respondents to think about intervention in relation to a specific impairment may not elicit the most appropriate information. It is also acknowledged that a forced choice method for the interventions may not have yielded the true range. However, an 'other' category was provided and these data points were included as discrete entries. The inherent bias associated with the use of a questionnaire must also be acknowledged.

### Future needs

This study has demonstrated the wide range of intervention strategies used by occupational therapists when working with people with apraxia. It is yet to be determined how therapists acquire knowledge about apraxia and how this relates to their choice of interventions.

## Conclusion

This study found that there was a sound level of agreement about apraxia which mirrored the literature, although further education should include the relationship between cognition and apraxia. Greater emphasis is placed on the environmental context during intervention, with a moderate use of the specific strategies that are advocated in the literature. Emerging evidence for intervention techniques, such as strategy training, must also be incorporated into clinical practice and education programmes.

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