

Pranayama: Potential Tools to Enhance Occupational Performance

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Abstract: It has recently been suggested that yogic philosophy provides a model for occupational therapy and that meditation and pranayama (yogic breathing exercises) can facilitate occupational performance. This literature review was undertaken to determine whether there is any evidence to support the use of pranayama to facilitate occupational performance. A literature search using AMED, BNI, CINAHL, HMIC, Medline and Old Medline for the term 'pranayama', limited to English language human research uncovered seven articles clinically applicable to occupational performance. The evidence suggests pranayama can influence, arousal, metabolism and exercise tolerance. Slow alternate nostril breathing should be considered when anxiety impairs occupational performance, and right nostril breathing should be considered for obesity, lethargy, and symptoms of hypothyroidism or similar metabolic disorders that inhibit function. Further research is required for evidence-based application of other pranayama techniques.

Key words: exercise, breathing, yoga, pranayama, evidence-based practice

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1. Introduction

Pranayama are breathing exercises traditionally used in yoga; an Asian system of lifestyle regulation (Mailoo, 2005). Yoga first developed in India thousands of years ago and has branched into four different paths. These are termed Karma, Jnana, Bhakti and Raja (Sivananda Yoga Vedanta Centre, 1999). The traditional purpose of all of these paths was spiritual

advancement. Karma yoga is a process of selfless action to avoid incurring sin. Jnana yoga is a philosophical path to spiritual evolution based upon discrimination and dispassion. Bhakti yoga consists of devotional service to God, and can therefore be considered a religious form of yoga. Raja yoga is considered the scientific path because it based on psychology and physiology (Sivananda Yoga Vedanta Centre, 1999).

Bhakti is considered by some to be the branch of yoga most suited to spiritual advancement in modern times (Swami Prabhupada, 1982). Raja yoga however is the best known branch in the West, and is practiced worldwide for its health benefits. Raja yoga has eight steps. These are abstention (from harming others), observance (of self-discipline), steady body postures, pranayama

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Table 1. Pranayama Methods (Sivananda Yoga Vedanta Centre, 1999, Khlasa, 2005)

Description	Name	Method	Possible clinical applications
Full yogic breathing		1. On inhalation, expand the abdomen first, then the ribcage, then the upper portion of the lungs. → 2. Breathe out fully allowing the abdomen to cave in.	Currently used by physiotherapists to prevent atelectasis.
Right nostril breathing	Surya anuloma viloma	Close the left nostril and breathe through the right.	Sympathetic nervous system and metabolic stimulation. Treatment of lethargy and obesity.
Left nostril breathing	Chandra anuloma viloma	Close the right nostril and breathe through the left.	Anxiety management
Alternate nostril breathing	Nadi Shodhana	1. Inhale through the right nostril, → 2. Hold breath, → 3. Exhale through the left, → 4. Hold breath, → 5. Inhale through the left, → 6. Hold breath, → 7. Exhale through the right → Repeat the cycle	Anxiety management
Loud breathing	ujjayi	1. Inhale fully through both nostrils with a partially closed glottis. → 2. Hold the breath with upper cervical spine flexion and lower cervical spine extension (chin lock) and the pelvic floor muscles contracted (root lock). → 3. Exhale through the left nostril with a partially closed glottis. → 4. Hold the breath, contracting transverses abdominus.	Autonomic nervous system modulation. Metabolic modulation

(breath control), withdrawal from sense gratification, concentration of the mind, meditation and universal consciousness (Sivananda Yoga Vedanta Centre, 1999). Yoga has been recommended in Western occupational therapy literature to promote wellbeing (Kelly & McFarlane, 1991; Bracegirdle, 1997; Stein & Cutler, 1998; Taylor, 2001; Kluge, 2004).

Raja yoga has been used by occupational therapists with psychiatric patients as a relaxation technique, to increase attention span, self-confidence, coping skills, body awareness, and self-concept while providing a sense of achievement (Anderson & Winterbone, 1979; Taylor, 2001). Eakin (1979) reported decreased reliance on medication amongst psychiatric patients practicing yoga. Occupational therapists have also used yoga for stress management, to build strength, endurance and flexibility (Giles, 1985; Kluge, 2004) and to increase service-users' awareness of their own occupational risk factors (Kluge, 2004). Occupational therapists have

specifically used pranayama to facilitate physical and mental relaxation (Anderson & Winterbone, 1979), enhance energy flow and reduce pain during performance of activities of daily living (Kluge, 2004).

While there is a growing evidence base for yoga, application of research findings is difficult, because there are several different schools of yoga and a multitude of different techniques. Testing of each individual yogic technique is arguably needed for evidence based practice. This literature review was undertaken to determine whether there is any evidence to support the use of pranayama to facilitate occupational performance. There are several pranayama techniques. Those discussed in this literature review are summarised in Table 1. The brief descriptions in the first column are not standard, but intended to ease reading for those unfamiliar with yoga terminology.

For single nostril breathing techniques, the right thumb is used to close the right nostril or the right 4th and 5th digits are used to close the left



Fig. 1. The lotus position

The lotus position is a classic yoga sitting pose, used for meditation and pranayama because it is believed to enhance concentration (Sivananda Yoga Vedanta Centre, 1999). This was the position adopted by subjects in the study by Bhargava *et al.* (1988).

nostril. Attention is paid to the sensations of airflow in the nostrils and breath holding between inhalation and exhalation is common, though the duration of breath holding varies.

2. Method

A literature search using AMED, BNI, CINAHL, HMIC, Medline and Old Medline for the term 'pranayama', limited to English language human research articles produced 59 hits. Articles that did not specifically test pranayama, failed to specify the types of pranayama tested, or that could not be directly related to occupational performance were discounted. Seven articles remained. These were themed according to therapeutic effect, and analysed for validity.

3. Literature Analysis

3.1. *Pranayama for arousal modulation*

Arousal modulation is used by occupational therapists to facilitate occupational performance, control pain (Beresford, 1996; Hammond, 1996) and reduce health risks (King, 1996) in both mental (Duncombe, 1998) and physical settings (Cicinelli, 1996). Modalities advocated in occupational therapy literature include biofeedback (Stein & Cutler, 1998), visualisation (Levitt, 2005) progressive muscle relaxation (Finlay, 1997; Levitt, 2005), tai chi (Stein & Cutler, 1998), meditation (Bracegirdle, 1997; Abreu 1998; Stein & Cutler, 1998), yoga (Anderson & Winterbone, 1979) and breathing exercises (Levitt, 2005). As autonomic function, arousal and metabolism are inter-dependent, they are considered together in this review.

3.1.1. *Pranayama to decrease arousal*

Alternate nostril breathing

Bhargava *et al.* (1988) studied the effects of 4 weeks training in alternate nostril breathing and normal amplitude hyperventilation, on cardiovascular, respiratory and autonomic parameters during maximal breath holding on 10 healthy males aged 19–28. Alternate nostril breathing was practiced in the lotus position (Fig. 1) for 30 minutes per day, with 1–2 second holds after each inspiration. Once competent in alternate nostril breathing, hyperventilation was added to the regime. The subjects were not permitted to undertake any other form of exercise during the trial. Breath holding time, heart rate, electrocardiogram (ECG) and galvanic skin resistance were measured with a 4-channel polyrite (Medicare, India). Blood pressure was recorded by the auscultatory method. Subjects were tested holding their breaths maximally after normal inspiration, normal expiration, deep inspiration, full expiration, and deep inspiration after 5 maximal breaths in 15 seconds. All of the tests were conducted in controlled conditions before the subjects commenced training, and then repeated in the same conditions after 4 weeks of pranayama training. Before and after differences

were analysed with the paired t-test.

Baseline blood pressure decreased by an average of 8.8 mmHg (7%) systolic ($p<0.001$) and 4.8 mmHg (7%) diastolic ($p<0.05$). Heart rate ($p<0.01$) and blood pressure ($p<0.08$) at the end point of maximal breath holding, decreased for all of the breath holding tests. All breath holding times significantly increased ($p<0.05$) but there was no change in ECG except for heart rate, and no identifiable pattern of changes in galvanic skin resistance.

Bhargava *et al.* (1988) believed the observable changes were due to increased vagal tone, decreased sympathetic activity and possibly increased tolerance to raised $p\text{CO}_2$ and low $p\text{O}_2$. As there was no control group, the validity of this research is not assured. The results may reflect a Hawthorne effect (Polgar & Thomas, 2000), unregulated influences or physiological adaptations to sitting in the lotus position. As Bhargava *et al.* (1988) combined two breathing techniques in their trial, changes cannot be scientifically attributed to either technique individually, so this research cannot support evidence based practice. Finally, the abstract of Bhargava *et al.* (1988) states 20 subjects were used, while the methodology states only 10 were used. This discrepancy casts doubt over the journal review process and quality of the article. Despite its methodological flaws, the work of Bhargava *et al.* (1988) suggests decreased sympathetic activity at baseline and in response to the stress of breath holding results from some component of alternate nostril breathing combined with hyperventilation. Research on alternate nostril breathing used alone is required to validate its use.

Pal *et al.* (2004) studied the effect of three months of regular alternate nostril breathing on 30 healthy male non-smoking first year undergraduate medical students (aged 17–20). The sample was randomly divided into an experimental group ($n=15$) and control group ($n=15$). Experimental subjects underwent 15 days of training in alternate nostril breathing followed by 1/2 hour practice sessions every morning and evening under expert guidance for 3 months. Breathing was timed so that subjects would inhale

for 6 seconds, hold their breaths for 6 seconds, exhale for 6 seconds and then hold for 6 seconds at end exhalation before inhaling again. The control group was given no instruction and was not permitted to practise pranayama. All of the subjects were on a controlled diet and were not permitted to partake in yoga or any other physical exercise for the duration of the trial.

Heart rate responses to standing, deep breathing and the valsalva manoeuvre were measured at the start and end of the experimental period to assess the effects of alternate nostril breathing on autonomic function. Heart rate was monitored with a lead II ECG Nihon Kohden multi-channel polygraph (UK). Subjects were asked to lie supine for 5 minutes and then stand. Means of recordings from 3 repetitions of experiment were taken for statistical analysis. Subjects were then asked to take a full deep inspiration followed by full expiration sitting in a chair. The biggest heart rate change reading of 3 repetitions was used for statistical analysis. Change of heart rate during forced expiration against 40 mmHg of resistance (through a mouthpiece) was then recorded. Longest heartbeat interval after the manoeuvre was divided by the shortest heartbeat interval during the manoeuvre. Highest ratio after 3 attempts was used for statistical analysis. Data was analysed with the students' t-test and analysis of variance (ANOVA).

In the experimental group after 3 months, when compared to their pre-exercise values and the control group, basal heart rate was significantly reduced ($p<0.05$)(12%). Maximum heart rate in response to standing was significantly reduced ($p<0.05$)(7% compared to pre-exercise, 4% compared to controls) and was achieved after fewer beats ($p<0.001$)(20% compared to pre-exercise, 22% compared to controls), minimum heart rate was achieved sooner ($p<0.001$)(24% compared to pre-exercise, 23% compared to controls), and time taken for heart rate to stabilise was less ($P<0.001$)(9% compared to pre-exercise, 13% compared to controls). There were no significant valsalva ratio changes in either group.

Pal *et al.* (2004) concluded that slow breathing improves vagal activity and regular

practice of slow breathing exercise for 3 months improves autonomic functions. Although Pal *et al.* (2004) randomly assigned subjects to their experimental and control groups, the two groups were well matched for the parameters used in their experiment. Unfortunately scientific conclusions cannot be drawn about alternate nostril breathing from this research because the effects noted may have been due to the speed of breathing. A slow breathing control group would have been more appropriate to test this type of pranayama. As significant effects were only measured after 3 months, this research does not support the use of slow alternate nostril breathing for the immediate treatment of acute anxiety. It does however support the use of this technique to treat trait anxiety or for prophylactic anxiety management in cases where anxiety impairs occupational performance.

Left nostril breathing

Telles *et al.* (1994) used a sample of students from the Vivekananda Kendra Yoga Research Foundation (Bangalore India) to compare the autonomic and metabolic effects of right nostril breathing (n=12) with left nostril breathing (n=12) and two alternate nostril breathing control groups (n=12 each). All groups were randomly selected from the sample and completed 27 cycles of their exercise 4 times per day for one month. Volar galvanic skin resistance of the ring and index fingers, heart rate and respiratory rate were measured with a 4-channel polygraph (Lafayette, USA). Oxygen consumption was measured using the closed circuit Benedict-Roth apparatus (INCO, India). All measures were taken at 4:00 am, once before training commenced and once after one month of pranayama training. Data was analysed with Wilcoxon's paired signed ranks test.

The left nostril breathing group showed a significant ($p < 0.05$) increase (145%) in volar galvanic skin resistance while no comparable change was seen in the control group. This suggests reduced sympathetic stimulation of the palm sweat glands (Telles *et al.*, 1994). None of the other parameters significantly changed in the left nostril breathing group, but resting heart rate increased significantly in the control and right

nostril breathing groups. Telles *et al.* (1994) concluded that left nostril breathing modulates some sympathetic outflows but not others.

Telles *et al.* (1994) could have increased the power of their statistical testing by allocating 16 subjects to each of two experimental groups and one control, instead of 12 to each group with 2 separate controls. They looked for statistically significant differences within each group, but did not analyse the significance of differences between the groups. The groups were subjected to a controlled lifestyle and diet for the duration of the trial, but were randomly selected and not deliberately matched by physiological variables. Alternate nostril breathing is not a suitable control, because it involves repeated periods of left nostril breathing. Normal breathing may have been more suitable. All of the subjects underwent general yoga training during the trial. This may have complicated the physiological changes identified in the groups. Due to these factors, while this research suggests left nostril breathing may reduce arousal, the evidence presented is weak and inconclusive. Even if the difference in galvanic skin resistance was due to the effect of left nostril breathing on sympathetic outflow, that difference may not be clinically significant for occupational therapy.

Loud yogic breathing with long breath holding

Telles & Desiraju (1991) studied breath holding during loud breathing (ujjayi) without chin lock, in 5 healthy males. Subjects were selected because they normally practised this breathing technique. The time ratio of inspiration:holding:expiration was 1:4:2. Tidal volume, and respiratory rate were measured with a spirometer. Oxygen consumption was measured with Benedict-Roth apparatus. Telles & Desiraju (1991) utilised a same-subject controlled repeated measurements design. Readings of 4 minutes duration were taken before, during and after each pranayama practice. The duration of each pranayama practice may have been 4 minutes, but this was not clearly described by the authors. Test sessions were repeated 10–15 times each. The averages of the measurements for each subject

from all of the test sessions were used for data analysis.

DuBois formula was applied to estimate metabolic rate and data was analysed with the matched t-test and 2-way ANOVA. There was a mean 19% decrease in oxygen consumption during loud yogic breathing (t-test $p < 0.05$ ANOVA $p < 0.03$; $F 5.8$, $df 2,8$) but parameters returned to baseline in the post pranayama test period. Telles & Desiraju (1991) concluded that loud yogic breathing with long breath holding reduces metabolic rate by 20%. This conclusion was based on the fact that parameters returned to normal immediately after pranayama, indicating that no oxygen debt occurred despite decreased oxygen consumption.

Telles & Desiraju (1991) used parametric tests that are arguably too sensitive for their sample size of 5. There is little evidence to support use of the DuBois formula to estimate metabolic rate (Gibson & Numa, 2003) so the extrapolations made may not be accurate. The reason for variation between subjects of the numbers of repeat test sessions is not clear, and this could have been influenced by experimenter bias. Telles & Desiraju (1991) considered the before-pranayama measurements of each test session to be a control. This did not eliminate the possibility of order effects. Neither does it validate the use of yogic loud breathing instead of breath holding alone. Finally, because anxious and hyperactive people are the main target groups for arousal reducing techniques, loud yogic breathing with long breath holding requires expert instruction, and the effects of pranayama in this study did not last beyond the duration of its practice, Telles & Desiraju (1991) proved no applicability of this technique to occupational therapy.

3.1.2. *Pranayama to increase arousal*

Loud yogic breathing with short breath holding

Telles & Desiraju (1991) studied short breath holding during loud breathing (ujjayi) without chin lock, in 5 healthy males who usually used this type of pranayama. Telles & Desiraju (1991) used the same methodology as described for their

testing of loud yogic breathing with long breath holding (described above), with two exceptions. The time ratio of inspiration:holding:expiration was 1:1or less:1, and test sessions were repeated only 7–14 times each. Oxygen consumption increased significantly (t-test $p < 0.025$, ANOVA $p < 0.01$; $F 8.7$ $df 2,8$) by an average of 52% during pranayama but returned to baseline in the post pranayama test period. Telles & Desiraju (1991) concluded that short breath holding loud yogic breathing increases metabolic rate by over 70%.

The methodological weaknesses of Telles & Desiraju (1991) are summarised above. It is possible that the breath-holding component of this breathing exercise does not contribute towards its positive effect on metabolic rate. If Telles & Desiraju's (1991) findings are accurate loud yogic breathing could possibly be used to treat obesity or hypothyroidism. Confirmation is required by independent research with a larger sample. As the effect of loud yogic breathing on metabolism did not last beyond the duration of the exercise practice, it is unlikely this technique could enhance short-term occupational performance. Current English language research evidence does not therefore justify its use as an occupational therapy tool.

Right nostril breathing

Telles *et al.* (1994) (methodology described on page 12) found that resting oxygen consumption increased by 37% ($p < 0.05$) after a month of four-times-daily practise of right nostril breathing, but did not change significantly with left or alternate nostril breathing. Heart rate increased significantly ($p < 0.001$) with right (10%) and alternate (7%) nostril breathing, but not with left nostril breathing. Telles *et al.* (1994) concluded that right nostril breathing increases metabolism. As heart rate is a function of arousal, it is possible that right nostril breathing affected waking arousal levels as well as metabolism. Telles *et al.* (1994) failed to specify the durations of their oxygen consumption measurements, so it is difficult to gauge the reliability of their findings. It is possible that yoga training which all of the subjects were exposed to was responsible for the increase in metabolism and this adaptation was

inhibited in some way by left nostril breathing.

Telles *et al.* (1996) tested right nostril breathing on 8 female and 4 male volunteer yoga students (n=12) free of major illnesses with a randomised crossed-over same subject controlled trial. Normal breathing was the control. Experimental and control assessments were taken on two separate consecutive days. Oxygen consumption over 5 minutes was measured using the closed circuit Benedict-Roth apparatus (INCO, India). Heart rate, volar galvanic skin resistance of the ring and index finger tips, and respiratory rate were measured over 10 minutes using a 10-channel polygraph (Medicare India). Blood pressure was measured with a stethoscope and mercury sphygmomanometer. Digit pulse volume was measured with a photoplethysmograph on the volar surface of the distal phalanx of the left thumb. Baseline measures were taken as soon as the subjects woke. The experiment or control was then practised for 45 minutes and then the measures were repeated. Data was analysed with the 2-factor ANOVA, multiple comparison Tukey test and t-test for paired data. A 17% average increase in oxygen consumption ($p < 0.05$), 9.4 mmHg average increase in systolic blood pressure ($p < 0.05$) and 45.7% decrease in digit pulse volume ($p < 0.05$) were apparent in the experimental trials, but there were no significant changes in the control. These haemodynamic changes are consistent with increased arousal. Telles *et al.* (1996) therefore concluded that right nostril breathing stimulates increased metabolism, and may increase cardiac sympathetic tone or reduce vagal tone. The equipment used by Telles *et al.* (1996) is respected as standard for the parameters measured. If the subjects were normally distributed for the parameters tested, this research trial was well constructed and supports the use of right nostril breathing to arouse and increase the metabolic rate of healthy individuals. Trials of right nostril breathing on patient groups with poor arousal or metabolic deficiencies are required to fully validate its clinical use.

3.2. *Pranayama for Exercise tolerance*

Exercise tolerance and fatigue can be major limiting factors of occupational performance.

Traditionally, occupational therapists manage fatigue with practical adaptations and energy conservation (Mailoo & Williams, 2004). Kluge (2004) however recommended yoga to increase energy levels and endurance.

Full yogic breathing combined with alternate nostril breathing

Raju *et al.* (1986) tested the effect of 20 days of pranayama training on exercise tolerance in 12 healthy volunteers (6 male, 6 female) of comparable age undergoing a yoga training certificate course. All of the subjects were from sedentary backgrounds.

Submaximal exercise testing was conducted using Balke's protocol, which was widely considered the most appropriate method (Roca *et al.* 1997). Each subject was tested on a motorised treadmill (Venky, India) on an empty stomach in an air-conditioned room. Heart rate and ECG were measured with a cardiac monitor (Olli-Finland). Blood pressure was measured with a sphygmomanometer. Minute ventilation and fractional oxygen in expired air were measured by the Morgan Transfer Test (P.K. Morgan Ltd, England). Fractional expired CO₂ was measured with Haldane's apparatus. pO₂ and SaO₂ from capillary blood were measured with an AVL-Micro Blood Gas Analyser (Switzerland). The above parameters were initially recorded at rest and then during every 4th minute of sub-maximal exercise. Urine samples were taken before and after exercise to measure urinary lactate, and blood taken from the antecubital vein before and immediately after exercise was used to measure blood lactate and pyruvate. Lactate was estimated with the Barker & Summerson method (Barker, 1983). Pyruvate was estimated using the Friedemann Haugen method, which was widely recognised as simple and accurate (Wolcott, 1985). Rate of oxygen consumption (VO₂) was estimated from the minute ventilation, fraction of expired CO₂ and fraction of O₂.

Following initial exercise testing, subjects practised full yogic breathing, full yogic breathing with breath holding, alternate nostril breathing and alternate nostril breathing with breath holding sequentially for 10 minutes each, followed by 20

minutes of supine relaxed lying, daily for 20 days. After 20 days exercise testing was repeated. Data was analysed with the student's paired t-test. In the male subjects immediate post-exercise pO_2 was significantly ($p<0.05$) increased (9%) after pranayama training compared to pre-training, and there were significant ($p<0.05$) reductions (41%) in minute ventilation and VO_2 . Urinary lactate significantly increased with initial exercise testing but not with exercise testing post training. In females, immediate post-exercise pO_2 was significantly ($p<0.05$) increased (29%) after pranayama training compared to pre-training.

The Barker & Summerson method was once the most respected way of estimating lactate concentrations, but it is easily contaminated due to its high sensitivity (Barker, 1983). It has therefore been superseded by spectrophotometric analysis with lactic dehydrogenase (Barker, 1983). The Raju *et al.* (1986) methodology would have been more reliable if they used up-to-date technology. It is also unclear why they considered data for males and females separately. This may simply be because some differences were not statistically significant when the sample was considered as a whole. The individual sex sample sizes of 6 may be too small to ensure external validity. As there was no control group, the changes seen may have been due to unrecorded influences. The periods of relaxed supine lying may also have facilitated adaptation, but this is unlikely to have been significant, considering that many people adopt supine lying during sleep. The only relevant conclusion that can be drawn from this research is that that training in a combination of full yogic and alternate nostril breathing with breath holding may increase post exercise pO_2 , thus facilitating recovery from exercise. Repetition of this research design with a control group, separate experimental groups for each technique, modern technology and a larger sample size might provide more solid evidence for the use of either alternate nostril breathing, full yogic breathing, or both to increase exercise tolerance.

3.3. Pranayama for strength

Raghuraj *et al.* (1997) tested the effects of left, right and alternate nostril breathing on grip

strength in right-handed children aged 11 to 18. A sample of 130 was randomly divided into five groups. These were right nostril breathing ($n=30$), left nostril breathing ($n=30$), alternate nostril breathing ($n=30$), breath awareness ($n=30$) and hand positioning (as normally used to close nostrils $n=10$). All breathing exercises were practiced for 27 repetitions 4 times a day. Left and right hand grip strength (best of three attempts) measured with a grip dynamometer (Anand Agencies, India) at the beginning and end of a 10 day yoga camp.

Right grip strength increased significantly with alternate nostril breathing ($t=3.19$ $p<0.005$), right nostril breathing ($t=2.69$ $p<0.05$) and left nostril breathing ($t=2.95$ $p<0.01$). Left grip strength also increased significantly with alternate nostril breathing ($t=2.13$ $p<0.05$), right nostril breathing ($t=3.45$ $p<0.002$) and left nostril breathing ($t=2.31$ $p<0.05$). The breath awareness and hand posture groups showed no significant increases.

Raghuraj *et al.* (1997) concluded right, left and alternate nostril breathing can increase hand grip strength, but proposed no physiological mechanisms behind their findings. The long term effects of single or alternate nostril breathing on grip strength were not determined by this study. The groups were not matched, and as the results are not explainable in physiological or medical terms independent research is required to confirm or reject the validity of the results.

4. Cautions

Complete review of all pranayama related literature is beyond the scope of this paper. Pranayama practice based on the information provided in this paper alone is not advised and may not be safe. Hyperventilation can cause fainting and contributes to bowel disorders (Limb, 2005). No adverse effects from any of the other techniques mentioned in this paper were highlighted in the literature reviewed. Another pranayama technique has however been anecdotally associated with pneumothorax (Johnson *et al.*, 2004). Techniques have been described in this document to aid estimation of

their physiological effects only. Therapists and members of the public wishing to learn pranayama should seek authoritative instruction.

5. Summary

Much of the published research on pranayama, does not support evidence based practice due to poor specificity. Evidence from one research publication weakly suggests that loud yogic breathing without breath holding may increase metabolism during periods of practice. No evidence to the contrary was uncovered. There is also weak evidence from one research paper that alternate nostril breathing practiced 4 times daily in conjunction with full yogic breathing may increase exercise tolerance. Reasonable evidence from one publication suggests that three months practice of slow alternate nostril breathing increases vagal tone and improves aspects of autonomic nervous system function. It is not clear which properties of slow alternate nostril breathing are responsible for these effects, but this technique may be a useful tool for occupational therapists in the treatment of trait anxiety. There is strong evidence from one publication that right nostril breathing increases metabolic rate during the period of practice, and weak evidence from another paper that this effect may be prolonged. Other research not analysed in this review suggests health benefits from pranayama that are not directly related to occupation.

6. Conclusions

Occupational therapists who integrate yoga into their practice and use pranayama, should consider choice of technique based on the pathology and physiological needs of each individual service-user, and the evidence of therapeutic effect for each technique. Slow alternate nostril breathing should be considered when anxiety impairs occupational performance, and right nostril breathing should be considered for obesity, lethargy, and symptoms of hypothyroidism or similar metabolic disorders if these inhibit function. Further research is required for evidence-based application of other pranayama

techniques.

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8. References

- Abreu, B.C. (1998). The quadraphonic approach: Holistic rehabilitation for brain injury. In: Katz, N. (ed.), *Cognition and occupation in rehabilitation. Cognitive models for intervention in occupational therapy*. pp. 51–97. Bethesda: American Occupational Therapy Association.
- Anderson, F., Winterbone, A. (1979). Yoga in a short stay Psychiatric Unit. *Br. J. Occup. Ther.*, 42(8), 191–193.
- Barker, S. B. & Summerson, W. H. (1983). The colorimetric determination of lactic acid in biological material. *J. Biol. Chem.* 138: 535–554.
- Beresford, S. (1996). Cancer. In: Turner, A., Foster, M., & Johnson, S.E. (eds.) *Occupational therapy and physical dysfunction. Principles, skills and practice*. 4th ed., pp. 851–870. New York: Churchill Livingstone.
- Bhargava, R., Gogate, M.G., & Mascarenhas, J.F. (1988). Autonomic responses to breath holding and its variations following pranayama. *Indian Journal of Physiology & Pharmacology*, 32(4), 257–264.
- Bracegirdle, H. (1997). Developing physical fitness to promote mental health. In: Creek, J. (ed.) *Occupational therapy and mental health*. 2nd ed., pp. 195–211. New York: Churchill Livingstone.
- Cicinelli, L. (1996). Back pain. In: Turner, A., Foster, M., Johnson, S.E. (eds.), *Occupational therapy and physical dysfunction. Principles, skills and practice*. 4th ed., pp. 667–690. New York: Churchill Livingstone.
- Duncombe, L. (1998). The cognitive-behavioural model in mental health. In: Katz, N. (ed.), *Cognition and occupation in rehabilitation. Cognitive models for intervention in occupational therapy*. pp. 165–191. Bethesda: American Occupational Therapy Association.
- Eakin, P. (1979). Yoga (letter). *Br. J. Occup. Ther.*, 42(11), 295–296.
- Finlay, L. (1997). *The practice of psychosocial occupational therapy*. 2nd ed., Cheltenham: Stanley Thornes.

- Gibson, S., Numa, A. (2003). The importance of metabolic rate and the folly of body surface area calculations. *Anaesthesia*, 58, 50–83.
- Giles, G.M. (1985). Anorexia nervosa and bulimia: An activity-oriented approach. *Am. J. Occup. Ther.*, 39(8), 510–517.
- Hammond, A. (1996). Rheumatoid arthritis. In: Turner, A., Foster, M., & Johnson, S.E. (eds.), *Occupational therapy and physical dysfunction. Principles, skills and practice*. 4th edition, pp. 747–765. New York: Churchill Livingstone.
- Johnson, D.B., Tierney, M.J., & Sadighi, P.J. (2004). Kapalabhati pranayama: Breath of fire or cause of pneumothorax? A case report. *Chest*, 125(5), 1951–1952.
- Kelly, G. & McFarlane, H. (1991). Zen in the art of occupational therapy, part two. *Br. J. Occup. Ther.* 54(4), 130–134.
- Khalsa, G.K. (2005). Kundalini Yoga. Available from URL: <http://www.kundaliniyoga.org/> accessed 14:39 29/1/2006.
- King, J.C. (1996). Acute cardiovascular disorder and disease. In: Turner, A., Foster, M., & Johnson, S.E. (eds.) *Occupational therapy and physical dysfunction. Principles, skills and practice*. 4th edition, pp. 779–796. New York: Churchill Livingstone.
- Kluge, J. (2004). Yoga therapy. An integrative approach. *OT Practice*, 9(17), 22–24.
- Levitt, V.B. (2005). Anxiety disorders. In: Cara, E., & MacRae, A. (eds.) *Psychosocial occupational therapy. A clinical practice*. 2nd ed., pp. 193–234. New York: Thomson Delmar Learning.
- Limb, M. (2005). Gut response to better breathing. *Frontline*, 11(19), 16.
- Mailoo, V.J. (2005). Yoga: An ancient occupational therapy? *Br. J. Occup. Ther.*, 68(12), 574–577.
- Mailoo, V.J., Williams, C.J. (2004). Psychoneuroimmunology: A theoretical basis for occupational therapy in oncology? *Int. J. Ther. Rehabil.*, 11(1), 7–12.
- Pal, G.K., Velkumary, S., & Madanmohan (2004). Effect of short term practice of breathing exercises on autonomic functions in normal human volunteers. *Indian Journal of Medical Research*, 120(2), 115–121.
- Polgar, S., & Thomas, S.A. (2000). *Introduction to research in the health sciences*. 4th edition. Edinburgh: Elsevier Churchill Livingstone.
- Raghuraj, P., Nagarathna, R., Nagendra, H.R., & Telles, S. (1997). Pranayama increases grip strength without lateralized effects. *Indian Journal of Physiology & Pharmacology*, 41(2): 129–133.
- Raju, P.S., Kumar, K.A., Reddy, S.S., Madhavi, S., Gnanakumari, K., Bhaskaracharyulu, C., Reddy, M.V., Annapura, N., Reddy, M.E., Girijakumari, D., Sahay, B.K., & Murthy, K.J.R. (1986). Effect of yoga on exercise tolerance in normal healthy volunteers. *Indian Journal of Physiology and Pharmacology*, 30(2), 121–132.
- Roca, J., Whipp, B.J., Agusti, A.G.N., Anderson, S.D., Casaburi, R., Cotes, J.E., Donner, C.F., Estenne, M., Folgering, H., Higenbottam, T.W., Killian, K.J., Palange, P., Patessio, A., Prefaut, C., Sergysels, R., Wagner, P.D., & Weisman, I. (1997). Clinical exercise testing with reference to lung diseases: indications, standardization and interpretation strategies. *Eur. Respir. J.* 10, 2662–2689.
- Sivananda Yoga Vedanta Centre (1999). *Yoga mind & body*. London: Dorling Kindersley.
- Stein, F., & Cutler, S.K. (1998). *Psychosocial occupational therapy*. San Diego: Singular Publishing Group.
- Swami Prabhupada, A.C.B. (1982). *Srimad Bhagavatam of Krsna–Dvaipayana Vyasa*. One volume edition. New York: Bhaktivedanta Book Trust.
- Taylor, S. (2001). Introducing a yoga group in an acute inpatient psychiatric facility. *OT Practice*, 6(6), 22–23.
- Telles, S., & Desiraju, T. (1991). Oxygen consumption during pranayamic type of very slow-rate breathing. *Indian Journal of Medical Research*, 94, 357–363.
- Telles, S., Nagarathna, R., & Nagendra, H.R. (1994). Breathing through a particular nostril can alter metabolism and autonomic activities. *Indian Journal of Physiology and Pharmacology*, 38(2), 133–137.
- Telles, S., Nagarathna, R., & Nagendra, H.R. (1996). Physiological measures of right nostril breathing. *Journal of Alternative and Complementary Medicine*, 2(4), 479–484.
- Walker, M.F., Drummond, A.E., Gatt, J., & Sackley, C.M., (2000). Occupational therapy for stroke patients: A survey of current practice. *Br. J. Occup. Ther.*, 63(8), 367–372.
- Wolcott, G.H., Freideman, T.E. & Haugen, G.E. (1985) Pyruvic acid II. The determination of keto acids in blood and urine. *J. Biol. Chem.* 147: 415–442.

The Effectiveness of Interprofessional Education in the Health Sciences: Implications for Occupational Therapy Education

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Abstract: Teamwork in health care settings is assumed to be beneficial for the client since it allows for a more holistic, comprehensive, co-ordinated approach. It is essential, therefore, for team members to have an adequate knowledge of, and respect for one another's professions. Traditionally, the different health care professions know little about each others specific skill-set and their roles as health care practitioners, whereas in interprofessional education (IPE), clinicians and/or students become familiar with the knowledge, skills and attitudes of each other to be effective team members. Changes in the current health care environment require well-versed, flexible, collaborative clinicians who work for the client's best interests. Traditional professional silos are no longer viable. IPE both at the undergraduate/pre-employment level and postgraduate/post-employment level is seen as one means to foster effective cross-professional communication, collaboration and client-centred care. IPE assists students to increase their knowledge of the roles and functions of other related professionals and enable an integrated approach to both in the workplace and in collaborative practice. Given that IPE is resource intensive, a question that can be posed is "how effective is IPE?" Many evaluation studies examining the effectiveness of IPE in health care contexts (mainly with physicians and nurses) have been completed. Only a few investigations have included other health professions such as occupational therapy, pharmacy, social work or physiotherapy. All of the IPE effectiveness studies report some form of positive benefit or outcome, but none of the studies are definitive or have been replicated. Many of the published health science IPE evaluation studies lack adequate rigor in terms of poor or unclear research design used, small sample size, non-randomisation of participants, lack of comparison control group, lack of acknowledgement of bias, non-standardised instruments used and/or statistical analyses completed. Several systematic reviews have been completed dealing with the published health science IPE evaluation literature, but the results have been largely inconclusive. Ongoing evaluation of the effectiveness of IPE in the health sciences is required.

Key words: occupational therapy education, students, curriculum, learning models

1. Introduction

Changes in health service delivery have blurred the boundaries that have traditionally defined the roles and responsibilities of the various health professional groups. Multi-professional teamwork and/or multi-skilled health care professionals have become the preferred model of practice promoted by health care policy makers, state and commonwealth government departments of health, professional colleges and regulatory bodies, professional associations, funding bodies and regional health provider organisations (Freeman, Miller, & Ross, 2000; Makely, 1998; Pew Health Professions Commission, 1994; Salvatori, 1997). The assumption is that these requirements and models are based on the assumption that when professionals with specialist knowledge working in health care teams pool their expertise, the work will be done more efficiently and effectively and that clients in turn will receive better care. However, research indicates that while there has been a generally held belief that professional teamwork and collaboration are desirable, there is little evidence to substantiate the view that teamwork and collaboration lead to an increase in the quality of care and well-being of clients, service users, and caregivers (Leathard, 1994).

There is an assumption that multi-professional team work will happen automatically in the workplace, although structural, organisational, and attitudinal factors may all potentially inhibit effective team development and collaboration (Farrell, Schmitt, & Heinemann, 2001). Structural and organisational barriers are difficult to overcome and may reflect in part the attitudes of individuals within institutions. Interprofessional pitfalls, including conflicting professional and organisational boundaries and loyalties, and negative mutual perceptions and prejudices are still prevalent (White, 1989).

Interprofessional education (IPE) has been proposed as one means to minimise barriers by increasing knowledge and understanding about other professionals' specific contributions to client care; such understanding can improve relationships, increase trust and dispelling of

stereotypes. Changing profession-specific approaches to undergraduate health science education in universities by introducing IPE as part of students' curriculum maybe one way to ameliorate this situation. As Barr and colleagues (1999) stated "interprofessional education was invoked to modify reciprocal attitudes and perceptions, to cultivate mutual respect and to explore ways in which collaboration could be made real" (p. 534). This new understanding has lead to a major paradigm shift in the education and working relationships of medical, nursing, and allied health students; one from a focus on learning and practicing in professional isolation to teaching and practicing alongside one another collaboratively (Freeth, 2001; Gilbert *et al.*, 2000).

This paper will present an overview of IPE by first defining what IPE is and how widely it has been adopted in the medical and health sciences arena. The advantages, disadvantages, facilitating factors and barriers to IPE will be discussed. The use of IPE in the medical education and occupational therapy education fields will be discussed and critiqued. Finally, the efficacy of IPE in health science education with students and professionals will be reviewed.

2. What is IPE?

Many health care professionals profess to engage in IPE, but the concept is not well defined in the literature. Although some writers note that there are differences between the following terms—interdisciplinary, interprofessional, collaboration, partnerships, cross-disciplinary, multi-professional learning, multidisciplinary, transdisciplinary, integrated and shared learning—they are often used interchangeably. "Different prefixes—multi, inter, cross, joint and shared—are attached to different adjectives—disciplinary and professional—which are in turn attached to different nouns—education, training, learning and study" (Barr, Hammick, Koppel, & Reeves, 1999, p. 536). 'Multi' describes the broad range of professional practitioners who undertake a particular project. 'Inter,' on the other hand, refers to the nature in which those professionals work together to complete a project. Hammick (1998)

Table 1. Dimensions of IPE*

* <i>Implicit or explicit</i> in the educational process or in everyday practice
* <i>Discrete</i> , as free-standing modules or <i>integrated</i> into other modules
* <i>All or part of a program</i> (more likely to form portion of postgraduate qualification or continuing professional development program)
* <i>General or particular</i>
* <i>Positive or negative</i> in its impact on relationships and collaborative work
* <i>Individual or collective</i> in its focus and assessment
* <i>Work / employment-based or college-based</i>
* <i>Shorter or longer</i>
* <i>Sooner or later</i> (different stages in qualifying / post qualifying learning)
* Based on <i>common learning needs or comparative learning</i> about respective roles, responsibilities, powers, duties and perspectives
* <i>Interactive or didactic</i> in approach (there is a predominance of the former)

* Source: Barr, 1996.

made a distinction between ‘multi’ and ‘inter’ when she described multiprofessional education as ‘simply learning together’ (e.g., in the same classroom) and interprofessional education as ‘learning together to promote collaborative practice’ (e.g., working on the same case study to resolve issues posed).

Oxley and Glover (2002) defined IPE as “a learning process in which different professionals learn from and about each in order to develop collaborative practice” (p. 2). Barr (1998) maintains, that by definition, IPE aims to encourage collaborative practice, but suggests that the objectives vary including: modifying attitudes and perceptions, enhancing motivation, securing common knowledge bases, reinforcing collaborative competencies, and effective change or improvement in practice. In this way, IPE assists students to increase their knowledge of the roles and functions of other related professionals and enables an integrated approach to both the workplace and collaborative practice. Using these definitions, IPE is a subset of multiprofessional education distinguished by its purpose and the methods that it employs to achieve it. Barr (1996) identified a number of core ‘dimensions’ of IPE and these are located on Table 1.

West (1997) described the characteristics of effective IPE as being: attainable / evolving shared vision; clear, shared objectives; mutual support; effective participation; task orientation;

information and appropriate management structures; and support for innovation. Parsell and Bligh (1999) identified six principles to guide interprofessional learning: (1) detailed planning and organisation involving all stakeholders, (2) integration of theory with practice and relevance to work, (3) interactive student-centred learning activities, (4) teachers as role-models for multiprofessional working, (5) establishment of a comfortable learning climate, and (6) rigorous evaluation for research and further development. A report from the UK Central Council for Nursing and Midwifery (2000) states that IPE should:

- * reflect the needs and interests of the user;
- * be derived from an integrative approach;
- * complement profession-specific knowledge;
- * have its main focus in practice, supported by interprofessional learning in academic components of programs; and
- * allow practitioners to identify and maintain their own philosophies, professional values and beliefs within interprofessional working environment.

3. How extensively has IPE been adopted?

In 1976, Bloom and Parad reported that only 36% of mental health training programs in the US included any form of IPE. In 1982, McPherson and Sachs reported that less than 30% of Canadian

Table 2. Professions Where IPE Has Been Used

* Medicine (Carpenter, 1995; Barr, 2001)
* Nursing (Barr, Freeth, Hammick, Koppel, & Reeves, 2000; Horsburgh, Lamdin, & Williamson, 2001)
* Social work (Carpenter, 1995; Connoer & Rees, 1997)
* Pharmacy (Greene, Cavell, & Jackson, 1996)
* Physiotherapy (Hilton, Morris, & Wright, 1995)
* Occupational therapy (Tryssenaar, Perkins, & Brett, 1996)
* Palliative care (Macleod & Nash, 1994)
* Dentistry (Parsell, Spalding, & Bligh, 1998)
* Psychology (Hall & Weaver, 2001)
* Midwifery (Mires <i>et al.</i> , 1999)
* Dietetics (Hall & Weaver, 2001)
* Health & public administration (Hall & Weaver, 2001)

and American medical schools had any IPE involvement. However, the scope and range of IPE activities and evaluation research has increased dramatically over the last two decades (Barr, Freeth, Hammick, Koppel, & Reeves, 2000). A number of fields, both inside, and outside, of the health sciences have discussed and evaluated IPE over the last two decades (see Table 2).

4. What Are the Advantages of IPE?

There are several advantages in IPE. For example, Rance (1996) in his assessment of the extent and value of IPE, claims that IPE provides added value in that it offers a “broader perspective to complement specialist professional expertise, and will ultimately make students more capable of securing employment” (p. 5). Freeth *et al.* (1998) listed the following benefits of IPE for employers: a reduction in the occurrence of communication breakdowns, an increase in morale and efficiency, and a decrease of ‘unhelpful protectionism.’ Barr (2000) maintains that IPE enhances personal and professional confidence, promotes mutual understanding between professions, facilitates intra- and inter-professional communication, and encourages reflective practice.

IPE can promote creativity in teaching and research and foster interprofessional co-operation. Additionally, another positive outcome documented in the literature is cost-effectiveness. IPE can lead to the development of skills required

to operate effectively within multi-disciplinary team contexts. McCroskey and Robertson (1999) outline a number of benefits for individual university staff members: an exposure to new ideas, an opportunity to work with different people, an increase in cultural sensitivity, an enhanced flexibility in working with students, a better sense of co-operation and networking between departments and an impetus to discover more community resources.

For students, it has been argued that meaningful interprofessional learning experiences can better prepare students for encountering the complexities of real-life interprofessional problems in the work environment. These experiences help to develop a holistic approach to working, based on common knowledge between disciplines and an awareness of diversity issues. Rance (1996) maintains that IPE leads students to recognise the overlap of professional functions and those activities that fall between professional areas. He also believes that IPE assists to break down professional roles within the development process which can lead to competition and conflict between professional groups. “This creates an environment in which students can develop a critical awareness of the limitations of professional roles and values” (Rance, 1996, p. 5). The IPE process challenges stereotypes, but also allows students to strengthen their own professional identities. O’Neill, Wyness, McKinnon, and Granger (1999) also state that students gain a greater understanding of other

Table 3. Advantages of IPE

* Enhances multi-disciplinary team functioning and communication
* Increases mutual understanding, support and respect of team members
* Facilitates and promotes collaborative practice thus limits the demands made on any one profession
* Reduces stress and increases job satisfaction and in turn improves staff morale, recruitment and retention
* Enhances client care since a combination of health care professionals working in unison is better placed to meet the users needs
* Allows for joint training in areas that have been identified as common skills such as ethics, report writing, communication skills, and clinical reasoning
* Creates potential for joint student fieldwork placements
* Creates research and development opportunities for staff and students
* Shared resources including faculty workload, classroom facilities and equipment
* Collaboration among students and faculty such as sharing ideas and goals and simulating the workplace

professions' roles and skills, begin to develop skills in interprofessional teamwork and gain knowledge and skills in relation to complex conditions that require intervention from a range of professionals.

Barr *et al.* (2000) summarised the four main benefits of IPE as providing: enhancement of motivation to collaborate, changes to attitudes and perceptions, cultivation of interpersonal, group and organisational relations and establishment of common value and knowledge bases. McGrath (1991) identified several advantages of interprofessional education: (1) more efficient use of human resources by enabling specialist staff to concentrate on specialist skills; (2) more effective service provision, by encouraging overall planning and goal orientation; and (3) a more satisfying work environment, through promoting a more relevant and supportive service. Further advantages of IPE are listed in Table 3.

5. What Factors Contribute to Effective IPE?

A number of factors favouring IPE have been cited. Parsell, Spalding, and Bligh (1998) suggested that the following factors promote effective IPE: balanced membership between professions, an attractive program for the participants, pre-event information, clear learning outcomes, interactive learning methods and a physically and psychologically comfortable learning environment. Parsell and Bligh (1999)

grouped the characteristics and conditions needed to achieve positive outcomes for IPE under four key dimensions: (1) relationships between different professional groups (values and beliefs that people hold); (2) collaboration and teamwork (knowledge and skills needed); (3) roles and responsibilities (what people actually do); and (4) benefits to patients, professional practice and personal growth (what actually happens). Barr (2001) cites a number of traits of effective IPE and these are listed on Table 4.

6. What Are the Disadvantages of and Barriers to IPE?

Not all IPE initiatives have been successful. According to Gilbert *et al.* (2000), many universities have developed courses for interprofessional groups of students, however, implementing them has proven to be challenging and problematic. One key challenge associated with IPE that Gilbert *et al.* identified was finding, co-ordinating, and scheduling time in professional curricula across disciplines. IPE courses often require small group experiences which can be both expensive and labour intensive. Other barriers are external and outside the control of individuals such as the requirements of professional bodies and course funding arrangements. Internal barriers such as location of departments and schools, timetables, individual course content and organising fieldwork placements can all make shared learning opportunities challenging to

Table 4. Factors Contributing to Effective IPE*

-
- * Putting service users and carers at the centre: involves clients in designing, teaching, participating and assessing programs
 - * Promoting collaboration: apply IPE principles to collaborative practice during placements or work-related assignments, collaboration within and between professions, within and between organisations and with communities, service users and their carers
 - * Reconciling competing objectives: ensure that these principles are protected as the essential qualities of IPE while ensuring that they are compatible with other objectives and their implications for program design, content and learning methods
 - * Reinforcing collaborative competence: reach beyond modification of attitudes and securing common knowledge bases to reinforce collaborative competencies necessary to cope with the complexity of contemporary practice
 - * Relating collaboration in learning and practice to a coherent rationale: gives reasons why interprofessional learning improves interprofessional practice grounded in theory
 - * Incorporating interprofessional values: such as inclusion, equality, openness, humility, mutuality, generosity and reciprocity
 - * Including common and comparative learning: treat comparative content as essential to inform learning from and about each other, to enhance understanding about respective roles and responsibilities and intelligent co-working
 - * Employing a repertoire of interactive learning methods
 - * Counting towards qualifications: assess IPE for awards to add value.
 - * Evaluating programs: subject IPE to systematic approval, validation and research
 - * Disseminating findings: inform other developments in IPE
-

* Source: Barr, 2001.

Table 5. Disadvantages of IPE

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- * Issue of accountability in practice following graduation would need to be addressed
 - * Maybe incompatible relating to professional identity and differences in preparation for clinical practice
 - * Resource constraints including scheduling and time challenges
 - * Competition between students including differing workloads and program rigor
 - * Relevance of combined courses to each profession including providing the right amount of material, offering suitable examples and establishing the appropriate content emphasis including choosing textbooks, evaluating student performance and willingness to compromise
-

administer and organise. Other disadvantages of IPE are listed in Table 5.

There are several other types of barriers to the promotion and development of IPE including attitudinal, educational, financial, and organisational (Williams & Wilson, 1998). Negative stereotypes and prejudices create divides between professional groups. Profession-specific requirements inhibit IPE despite the coordinated efforts of regulatory bodies and professional associations to overcome them. As well, funding models for educational courses undermine IPE efforts. “Multiprofessional education favours large classes and common curricula which inhibit interactive interprofessional learning that relies

upon small groups, generous staff/student ratios and facilitators with special training and experience as leading exponents reported” (Barr, 2000, p. 14). Logistics, geography and tensions between employers and universities create organisational barriers. Other barriers to IPE are listed in Table 6.

7. Should IPE Be Taught at the Undergraduate or Postgraduate Level?

Within the occupational therapy field, it is now possible to complete one’s professional education at either an undergraduate or graduate level (e.g., bachelors or masters level). It is also

Table 6. Potential Barriers to IPE*

* Historical interprofessional and intraprofessional rivalries
* Differences in history and culture of professions and educational institutions
* Differences in language and jargon between professional groups
* Limited university staff time for preparing and implementing IPE courses
* Lack of commitment of university staff to teach IPE courses
* Faculty attitude including resistance to compromise
* Resource constraints & limitations
* Curricular differences between professions
* Failure of past attempts to mount an IPE course successfully
* Scheduling conflicts and timetabling difficulties for IPE courses that are part of a larger curriculum
* Discrepancies in numbers of students from different student professional groups
* Contrasting learning and assessment methods between professional groups
* Varying levels of preparation, qualifications and status of students who undertake IPE
* Fears of diluted professional identity
* Differences in requirements, regulations and norms of professional education
* Differences in accountability, payment and rewards
* Attitudinal: negative stereotypes and prejudices
* Educational: profession specific requirements
* Financial: multiple funding streams
* Organisational: large classes, common curricula, experienced facilitators, geography, tensions between employers and universities

*Source: Williams & Wilson, 1998.

possible for already qualified occupational therapists to complete postgraduate studies at masters and doctoral level. The literature on the timing of learning about different professional roles is not clear. Harden (1998) suggests that what is most important is a pedagogical approach that is most appropriate for the phase or stage of the students'/clinicians' learning. Other writers suggest that the timing of IPE is best left to a postgraduate level or when students can undertake clinical practice together (Poldre, 1998). It is recognised that undergraduate IPE is very different from postgraduate IPE. However, the use of problem-based multidisciplinary cases and opportunities for small group learning can provide a basis for undergraduate IPE (Horsburgh, Lamdin, & Williamson, 2001). On the other hand, Barr (2000) suggests that IPE be offered at the postgraduate level. He states that "part-time programmes enable participants to draw upon work experience and to apply their interprofessional learning concurrently. As senior practitioners, participants have experience to exchange, including interprofessional experience, and may be in positions where they can influence

changes in practice" (p. 11). It should also be noted that work-based IPE is much more likely than university-based to result directly in changes in practice or benefit to patients (Barr, 2000). However, Tope (1996) suggests that postgraduate education is problematic because it offered an alternative view in that negative attitudes towards other professions are reinforced during pre-registration education, making them more difficult to shift. Yet as Barr (2000) observes, IPE is still predominantly offered at postgraduate level with a growing preference for work-based learning facilitated by consultants.

Several studies suggest that IPE should occur early in the education of health care professionals. Horak, O'Leary, and Carlson (1998) suggest that the experience of IPE at an early stage (such as to pre-employment or undergraduate students) may better facilitate interdisciplinary collaboration and multi-disciplinary teamwork among future health care professionals. Headrick, Wilcock, and Batalden (1998) as well as Headrick, Richardson, Priebe, and Bergman (1998) both recommend involving medical students in interdisciplinary projects with other health care students which are

relevant to their needs, scheduled as part of their core program and begun early in their education to optimise their learning experience about working with other professionals in a collaborative manner. Petrie (1976), on the other hand, suggests that clinicians must initially be secure in their competency in their chosen profession before embarking on interdisciplinary teamwork. Mariano (1999) also states that a thorough knowledge of one's profession is essential to understand the contributions of other team members in the context of client care. This suggests that IPE should only be introduced to both senior students and practicing clinicians to have an optimal impact on client care, interprofessional relationships and collaborative team work. Barr (2000) stated that "university-based and work-based interprofessional education can be seen as different but complementary, each capable of reinforcing the other" (p. 22). This issue remains unresolved and continues to be debated at this point in time.

8. How Extensively Has IPE Been Used in Medical Education?

Few evaluations of IPE have involved only medical students or practitioners. They are often partnered with at least one other health care professional group. Reviewing every IPE evaluation study that included medical students and/or practitioners as subjects was beyond the scope of this paper, therefore, only a few illustrative studies are described below. Tunstal-Pedoe, Rink, and Hilton (2003) evaluated how four health science professional groups of students (medicine, nursing, radiography, and physiotherapy) from the UK experienced learning together during the first term of their training courses when a new curriculum referred to as a Common Foundation Programme was implemented.

Students' attitudes to the new curriculum and to each other were surveyed at the beginning and end of their first term. The results demonstrated that students arrived at university with stereotyped views of other health care professional student groups and that students thought that their

interprofessional skills improved after being involved in IPE courses. Tunstal-Pedoe, Rink, and Hilton found that students whose parents worked as health care professionals (e.g., doctors or nurses) held stronger stereotyped views thus challenging the notion that it is possible to start a professional course without preconceived ideas about other professions. This would indicate that the use of IPE in the initial part of a students' education might be help to dispel or modify these preconceived ideas. Several limitations were inherent in this study including the use of a non-standardised survey instrument as well as the students only being from one university setting. Student participants were not randomly selected and no control group was included for comparison purposes.

Horsburgh, Lamdin, and Williamson (2001) attempted to quantify the attitudes of first-year medical, nursing, and pharmacy students (n=180) towards IPE at the beginning of a course at the University of Auckland, New Zealand. Students completed the *Readiness for Interprofessional Learning Scale* (RILS) (Parsell & Bligh, 1999) with the majority of them reporting positive attitudes towards shared learning. However, professional student groups did differ. Nursing and pharmacy students indicated more strongly that an outcome of learning together would be more effective for teamwork. Medical students were the least sure of their professional role, and considered that they required the acquisition of more knowledge and skills than nursing or pharmacy students. The benefits of interprofessional learning cited by the students included the acquisition of teamwork skills and enhanced professional working relationships. Students acknowledged that teamwork skills were an essential part of their learning, and that learning together in an IPE context improved working relationships after graduating. Two strengths of this study were the use of a standardised scale (RILS) with well documented psychometric properties and an adequate sample size to complete the data analyses.

Freeth and Nicol (1998) described the use of IPE with newly qualified staff nurses and final year medical students. The program took place in

an interprofessional clinical skills teaching unit. Each session was led by an experienced nurse lecturer and academic physician. A qualitative methodology using interviews was used to gather the IPE evaluation data. Freeth and Nicol found that the style of learning was participative with small interprofessional groups addressing a range of client management issues. The results indicated that both nurses, final year medical students, and their clinical managers were positive about the IPE program results. Limitations of this study included the fact that the sample size was not reported in the study, participants only included nurses and doctors and no other health professional groups, research methodology was poorly described in terms of how the data was obtained, and no information was reported about how the trustworthiness and consistency of the interview data obtained was ensured.

Tucker and colleagues (2003) evaluated the feasibility and effectiveness of shared learning of clinical skills for medical and nursing students. Clinical skills were learned by both sets of students by having them rotate through a series of skills stations taught by multi-professional facilitators. Quantitative and qualitative methods were used to gather the course evaluation data. The evaluation results indicated positive outcomes for the two groups of students including increased confidence levels, increased understanding of others' professional roles and personal development.

Mires *et al.* (1999) completed an evaluation of an IPE program involving a group of Scottish medical students (n=141) and midwifery students (n=35). The two groups of students completed three different questionnaires: a knowledge questionnaire, an attitude scale, and a course evaluation form. No information was provided about how the three questionnaires were developed and whether they were reliable and/or valid. Before the students started the course, significant differences between the medical and midwifery students were noted in their attitudes towards the roles and responsibilities of both professions in the management of pregnancy and normal labour. However, after the completion of the IPE program, the evaluation results indicated

that both the medical and midwifery students gained knowledge about pregnancy and childbirth as well as a better understanding of each other's role in the care of the women having babies. The change in attitudes towards professional responsibilities was most evident among medical students. Differences in professional attitudes between medical and midwifery students at the start of the course were less marked following completion of the course. Mires *et al.* concluded that IPE has a legitimate and valuable role in medical and nursing education when the intended educational objectives are clearly defined and the educational strategy and learning objectives selected are appropriate. Overall, this was a well-designed study except there was a notable difference in the sample sizes of the two comparison student groups with the ratio of medical to midwifery students being almost 4 to 1.

In summary, all of the studies reported positive outcomes for medical students and practitioners being involved in IPE. The studies used a combination of research design approaches to gather their evaluation data. Both quantitative and qualitative methods (or a combination of both) were used. Few of the studies used standardised scales (such as the *Interprofessional Education Perception Scale*, *Interprofessional Education Survey*, *Attitudes Toward Health Care Teams Scale* or the RILS) with established reliability and validity. This is a notable limitation. In terms of sampling, most of the studies had small sample sizes that were not randomly selected and did not include comparison matched control groups. Again, this is a notable limitation for quantitative studies. Little or no effort was made to control for different types of bias. In conclusion, while the published studies reported several positive outcomes, the results must be viewed in the context of research studies with notable inherent methodological weaknesses and thus be viewed with caution.

9. How Extensively Has IPE Been Used in Occupational Therapy Education?

A number of published manuscripts reporting IPE evaluation research results have included

occupational therapy (OT) students or clinicians as one of a number of health science participant groups. Hughes, Hemingway, and Smith (2005) discussed the issues related to the development of inter-disciplinary training at the undergraduate and postgraduate level for nursing and OT in the UK. A number of studies have involved OT students in the field of geriatrics promoting IPE (MacKinnon & MacRae, 1996; Miller, Ishler, & Heater, 1999; Thomas, Reigart, & Trickey, 1998). Tryssenaar, Perkins, and Brett (1996) presented an overview of IPE from an undergraduate OT student perspective while Paul and Peterson (2001) discussed interprofessional collaboration in the context of OT practice and research.

Cleary and Howell (2003) completed a survey that examined the educational interaction between American physiotherapy (PT) and OT students by mailing questionnaires to all the directors of directors of PT and OT educational programs (n=206). The response rates were 68% for OT and 66% for PT. The results indicated that nearly two thirds of PT and OT students had experienced at least one type of common learning some type of course work during their professional training. Cited benefits of IPE according to the education program directors included sharing resources, collaboration, learning about the other profession, and gaining respect for the other profession. Challenges to shared learning included resource constrains, curricular differences, competition and differences between disciplines, relevance of course work and different faculty expectations. None of the PT and only 13% of the OT directors reported that students shared clinical fieldwork experience. Barriers reported by program directors whose students did not take part in interdisciplinary education were resource constraints, curricular differences, faculty attitude and failure of past attempts. Cleary and Howell (2003) concluded that "most students in entry-level PT and OT programs in the United States do not currently have the opportunity to practice the teamwork that will be essential when they enter their respective professions" (p. 71). The results of the Cleary and Howell survey are contradictory since PT and OT students appear to be largely educated separately while after they

graduate, PT and OT clinicians often work together on client treatment teams.

Mu, Chao, Jensen, and Royeen (2004) evaluated the perceptions of a group of American OT, PT, and pharmacy students before and after they participated in an interprofessional training project (n=111). Using the *Interprofessional Education Perception Scale* (IEPS), the results indicated a significant increase in students' positive perceptions of IPE and the significant increases were independent of the duration of the training. The researchers found that students who participated in long-term training reported were more positive attitudes about IPE. Strengths of this study were the use of the IEPS which has documented reliability and validity (Hayward, Powell, & McRoberts, 1996; Luecht, Madsen, Taugher, & Petterson, 1990). As well, qualitative data was gathered through the use of a pre-observation assessment, post-observation assessment, student reflection journal, and weekly inquiry and experience debriefing sessions.

Pollard, Miers, and Gilchrist (2004) completed a study that examined students' attitudes to IPE and collaborative working, both before and after qualification at one British university. Ten different health professional student groups were involved in the study sample (n=852) including OT students (n=30). Students completed four sets of questionnaires that dealt with communication and teamwork, interprofessional learning, and interprofessional interaction. The results indicated that most health science students rated their communication and teamwork skills positively and had positive feelings towards IPE, but held negative feelings about interprofessional interaction. The investigators noted that two student professional groups, OT and social work, held particularly negative views of interprofessional interaction. Strengths of this study were the large sample size, the range of health professional students included, and the use of a three scales with preliminary levels of documented validity and reliability (*Entry Level Interprofessional Questionnaire, Interim Interprofessional Questionnaire, and Final Interprofessional Questionnaire*). Limitations of the study were the fact that student

participants were not randomly selected, were only from one educational institution and no control comparison group was used.

Reynolds (2003) evaluated the contribution of problem-based learning (PBL) to IPE. First year OT and PT student completed evaluations of their participation in PBL during an IPE module focussing on communication skills and client-focused approaches to care. Reynolds used a questionnaire that included attitude ratings and qualitative evaluations of PBL with a sample of 157 students. The findings indicated that students were positive that PBL contributed to both personal learning and team-working skills. Students felt that their understanding of therapists' roles within the multidisciplinary team context increased. Reynolds concluded that PBL made a positive, well-received contribution to learning during an IPE module. A positive feature of this study was that it used a mixed research methodology approach (quantitative and qualitative approaches). However, the student participants were from only one British university, were not randomly selected, and were not matched to a control group for comparison purposes.

Ponzer *et al.* (2004) reported on a group of Swedish medical, nursing, PT, and OT students' perceptions of IPE on clinical training wards (n=962). Students completed a self-report, non-standardised questionnaire. The study findings indicated that clinical education ward contexts provided students with realistic clinical practice scenarios in terms of training in their own professions as well as in learning more about the roles and responsibilities of other health care professional student groups. The importance of good communication for teamwork and for client care was also recognised by student participants. The quality of supervision and students' perception of their own professional roles were found to be significant factors regarding satisfaction with regards to the clinical education ward course. No psychometric information was reported for the questionnaire that was used by Ponzer *et al.* As well, a sample of convenience of students from one education institution were used as participants.

Wallstrom and Sanden (1998) described the

evaluation of students participating in a training ward from an IPE perspective. A total of 454 Swedish students from medicine (n=93), nursing (n=187), PT (n=74), OT (n=60), laboratory technology (n=26), and social welfare (n=16) were involved. The training ward offered students clinical training opportunities within the areas of medical and rehabilitation educational programs. The students reported that the training ward provided IPE opportunities in terms of team work, leadership, and clinical skills. "The placement clarified their future professional role and contributed to their understanding of the skills and occupational tasks of the other professionals" (Wallstrom & Sanden, 1998, p. 229). The main limitation of this study was the fact that the method of data collection and analysis was not specified. This made it challenging to judge the quality of research methodology used and how valid the reported results. Two strengths of this study were the large sample size and the fact that students from six different health disciplines were included as participants.

Parsell, Spalding, and Bligh (1998) described the outcomes of 28 British students from seven different health care professions (OT, PT, orthoptics, radiography, nursing, medicine, and dentistry) attending a two day IPE course. Pre- and post-course evaluation questionnaires were used assess the course format, content and learning methods. Students were able to identify issues surrounding multiprofessional teamwork and collaboration. Evaluation results showed that the IPE course increased knowledge and understanding of other health care professions, developed more positive attitudes, and demonstrated the importance of multiprofessional teamwork and communication. The students reported that they believed that early and regular opportunities for shared learning should be essential aspects of health science undergraduate courses. The major limitations of this study were the small sample size, non-standardised questionnaire used, and lack of a comparison control group. A positive feature of this study was the fact that student participants from seven different health care professions were included in the sample.

Reeves, Freeth, McCrorie, and Perry (2002) completed an evaluation of IPE that took place in a training ward placement with medical, nursing, PT, and OT students. The authors used a qualitative methodology where 19 clinical supervisors and 36 students were interviewed to elicit their views about the potential gains and drawbacks of implementing the training ward placement model and its influence on IPE. The students had to plan and deliver interprofessional care to a group of orthopaedic and rheumatology clients in the training ward setting. This context enabled students to develop professional specific skills and competencies when dealing with clients. At the same time, it also allowed students to enhance their teamwork skills in an interprofessional environment. Evaluation methods included questionnaires, interviews, and observations. The study results indicated that students valued the experiential learning they received on the training ward and felt the teaching ward context prepared them more effectively for future practice. More detail about the methods used to obtain the research data and whether it was checked for consistency and trustworthiness would have been helpful. It was challenging for the reader to make any definitive judgements about the rigorousness of the qualitative research methodologies used.

In summary, occupational therapy students and clinicians have been involved in a number of IPE evaluation studies. All of the studies cited here reported some type of positive benefit for participants from being involved in IPE. However, it should be noted that the majority of the studies had methodological limitations including sample small sizes, participant groups not being randomly selected, not including a control group for comparison purposes, participant groups being from one educational institution, and using questionnaires or scales with little or no documented reliability or validity. As with the medical student/physician IPE evaluation studies mentioned previously, the influence of different types of bias were also not clearly considered in the occupational therapy IPE evaluation literature. This would result in many of the studies not meeting the inclusion criteria for any systematic

reviews or meta-analyses. This would in turn limit the generalisability of the results of these studies.

10. What Is the Effectiveness of IPE?

A number of systematic reviews have been conducted evaluating the effectiveness of IPE. Barr and Waterton (1996) completed a review of the UK literature and found only 19 published evaluations of IPE. The evaluation studies varied widely in form, methodology used, purpose, and level of rigour. The study results indicated that under favourable circumstances, interprofessional learning methods can improve reciprocal perceptions of health care professionals, but this was not always so. Only one of the studies followed students up and found that improvements were not in fact sustained in the longer term. Therefore, none of the studies in the Barr and Watson systematic review demonstrated a benefit of IPE to clients who received services from health care professionals based on the criteria used.

In 1999, Barr and colleagues set out to complete a *Cochrane Collaboration* systematic review of the effectiveness of IPE. Initial searches produced 1,062 abstracts of which 99 were identified as potentially meeting the systematic review inclusion criteria. However, upon closer examination, none of the 99 papers fulfilled the *Cochrane Collaboration* selection criteria. Similar to the Barr *et al.* (1999) systematic review, Mattick and Bligh (2003) completed a systematic review of the effectiveness of IPE by searching the medical literature since 1998. A total of 24 research papers and 36 literature review papers were identified. It was found that the research papers generally described IPE initiatives and evaluated their success by collecting data in terms of participant knowledge or attitudes. After reviewing the 60 papers in detail, Mattick and Bligh concluded that “none of the studies identified conformed to the *Cochrane Collaboration* guidelines for a rigorous source of quantitative information on an intervention’s effectiveness” (p. 1008).

In another systematic review of interdisciplinary learning, Cooper, Carlisle, Gibbs, and Watkins (2001) found 141 studies. In the end,

only 21% were used in their review due to concerns about poor methodological rigour and poorly developed outcome measures. Based on their findings, Cooper *et al.* concluded that health science students benefited from IPE with outcome effects mainly relating to changes in knowledge, skills, attitudes, and beliefs, in particular related to the understanding of professional roles and team work. It was also found that early learning experiences for students were most beneficial to develop favourable attitudes towards interprofessional working and that IPE interventions required detailed and committed team planning and increased resources. It was also found that IPE approaches generally centred around the principles of adult education using PBL, small group learning, case studies, and experiential work. Finally, IPE outcomes primarily represented short-term effects only while few studies provided evidence of longer-term outcomes, in particular effects upon professional practice. Unlike the systematic reviews completed by Barr *et al.* (1999) and Mattick and Bligh (2003), Cooper *et al.* provided some preliminary empirical evidence of the benefits of IPE and it is presumed that similar benefits could be generalised to OT students.

Zwarenstein *et al.* (2001) completed a *Cochrane Collaboration* systematic review with the purpose of assessing the usefulness of IPE interventions compared to education in which professions were learning separately from one another. A total of 1,042 studies were located of which 89 were retained. Despite searching *Medline*, *CINAHL* and the grey literature, none of these studies met the strict *Cochrane Collaboration* inclusion criteria. The authors indicated that despite finding a large body of literature on the evaluation of IPE, they all lacked the methodological rigor needed to begin to convincingly understand the impact of IPE on professional practice and/or health care outcomes (Zwarenstein *et al.*, 2001). However, a more recent inclusive review suggested that interventions may be more effective at improving client care if they are: of longer duration, delivered in the work place, and were provided as part of continuing professional education rather than in

the earlier stages of professional develop (Koppel *et al.*, 2001).

Freeth, Hammick, Koppel, Reeves, and Barr (2002) completed an extensive review of evaluations of IPE based on a systematic review of articles reported on the following electronic databases: *Medline*, *CINAHL*, and *British Education Index*. Initially 417 studies were identified. After the studies were reviewed for research quality and rigor, only 217 met the final inclusion criteria. Upon review of the 217 selected IPE evaluation reports, it was found that most studies focused on post-registration continuing professional development, the learning was almost always formal (such as a workshop or seminar) and nursing and medicine were the most frequently represented professions. The primary research designs used by IPE investigators were before-and-after studies and longitudinal studies. Based on the critical review results, Freeth *et al.* suggested that more prospective studies and more longitudinal studies are required as well as more interpretive and critical studies. It was also suggested that since most IPE initiatives were multi-faceted, implementing a great number of mixed method studies would be appropriate.

In the 217 selected IPE evaluation studies, Freeth *et al.* (2002) reported outcomes of IPE in six categories: (1) learners' reactions, (2) changes in attitude or perception, (3) changes in knowledge or skill, (4) behavioural changes, (5) changes in the organisation or delivery of care, and (6) benefit to clients. The results indicated that half of the studies dealt with learners' reactions. The acquisition of knowledge and skills, and changes in organisational practice were the next most commonly identified outcomes. Fewer studies measured attitudinal changes, benefits to clients, or changes in practitioner behaviour. Positive outcomes reported from evaluations of IPE based in higher education were overwhelmingly in the form of reactions to the learning experience, changes in attitude, or perception and the acquisition of knowledge and/or skills. Positive outcomes reported for work-based IPE included changes in the organisation of practice and effects on clients. This difference may reinforce assertions that IPE is only effective when it is

work-based.

Some researchers conclude that systematic reviews of IPE have failed to demonstrate a causative link between educational intervention and improvements in client care (Zwarenstein *et al.*, 2001) while others express an alternative view (Cooper, Carlisle, Gibbs, & Watkins, 2001). “The emerging evidence suggests that it [IPE] can, in favourable circumstances and different ways, contribute to improving collaboration in practice” (Barr, 2000, p. 22). However, attempts to generalise the systematic review results must be tempered. First, the number of studies the systematic reviews are based on is small since many of the studies did not meet the systematic review or *Cochrane Collaboration* inclusion criteria. Second, bias must be taken into consideration at every step in the process of having an IPE evaluation or IPE outcome study published. For example, in most journals, manuscripts reporting successes are more likely to be accepted for publication than an article reporting failures. As well, *Medline*, which is used to list articles has a bias towards evaluations that include medical doctors and that are published in American journals. Finally, if systematic reviews included more of the IPE evaluation studies that used a qualitative research design or a combined qualitative-quantitative methodology approach, the body of knowledge would be much richer.

A number of recommendations can be made to improve the quality of IPE research studies completed including use of control groups, use of randomised controlled trials, use of prospective studies and using combined qualitative methods to evaluate outcome with quantitative methods to measure change resulting from IPE. As well, important research questions such as the cost effectiveness of IPE and the impact of IPE on professional practice and health care outcomes have not been rigorously studied (Cleary & Howell, 2003).

11. Conclusion and Summary

There is one notable limitation in this review of the effectiveness of IPE. The medical and occupational therapy literature were the main

sources of information consulted. It would have been helpful to include IPE evaluation studies from other fields such as education, business, and engineering. However, the majority of medical and occupational therapy studies cited did include other health care professions (such as nurses, social workers, pharmacists, and physiotherapists).

The drive towards community care for the benefit of clients is demanding different patterns of working, including the need to integrate (services), to collaborate (with other agencies and professionals), and for teamwork (share the same client-centred goals). As a result, there is a need to produce clinicians who are adaptable, flexible, collaborative team members, with highly developed interpersonal skills. This is providing the impetus and justification for IPE. IPE can be viewed as one way of providing clinicians with the necessary knowledge, skills, and attitudes to meet the demands of a challenging and dynamic health environment (Parsell & Bligh, 1999).

12. References

- Barr, H. (1996). Ends and means in interprofessional education: towards a typology. *Education for Health*, 9, 341–352.
- Barr, H. (1998). Competent to collaborate: towards a competency-based model for interprofessional education. *J Inter-Professional Care*, 12, 181–187.
- Barr, H. (2000). *Interprofessional education: 1997–2000. A review*. London, UK: United Kingdom Council of Nursing, Midwifery and Health Visiting.
- Barr, H. (2001). *Interprofessional education: Today, yesterday and tomorrow. A review*. London, UK: Learning and Teaching Support Network for Health Sciences & Practice from the UK Centre for the Advancement of Interprofessional Education.
- Barr, H., Freeth, D., Hammick, M., Koppel, I., & Reeves, S. (2000). *Evaluations of interprofessional education: A United Kingdom review for health and social care. A review*. London, UK: CAIPE/BERA.
- Barr, H., Hammick, M., Koppel, I., & Reeves, S. (1999). Evaluating interprofessional education: Two systematic reviews for health and social care.

- Br. Educ. Res. J.*, 25, 533–544.
- Barr, H. & Waterton, S. (1996). *Interprofessional education in health and social care in the United Kingdom: A report of a CAIPE survey*. London, UK: CAIPE.
- Bloom, B.L. & Parad, H.J. (1976). Interdisciplinary training and interdisciplinary functioning: A survey of attitudes and practices in community mental health. *Am. J. Orthopsychiatry*, 46, 669–677.
- Carpenter, J. (1995). Inter-professional education for medical and nursing students: Evaluation of a programme. *Med. Educ.*, 29, 265–272.
- Cleary, K.K. & Howell, D.M. (2003). The educational interaction between physical and occupational therapy students. *J. Allied Health*, 32, 71–77.
- Connoer, C. & Rees, S. (1997). Ways forward for shared learning between nursing and social work students. *Nurse Education Today*, 17, 494–501.
- Cooper, H., Carlisle, C., Gibbs, T., & Watkins, C. (2001). Developing an evidence base for interdisciplinary learning: A systematic review. *J. Adv. Nurs.*, 35, 228–237.
- Farral, M.P., Schmitt, M.H., & Heinemann, G.D. (2001). Informal roles and the stages of interdisciplinary team development. *J. Inter-Professional Care*, 15, 281–295.
- Freeman, M., Miller, C., & Ross, N. (2000). The impact of individual philosophies of teamwork on multi-professional practice. *J. Inter-Professional Care*, 14, 237–247.
- Freeth, D. (2001). Sustaining interprofessional collaboration. *J. Inter-Professional Care*, 15, 37–46.
- Freeth, D. & Nicol, M. (1998). Learning clinical skills: An interprofessional approach. *Nurse Education Today*, 18, 455–461.
- Freeth, D., Meyer, J., Reeves, S., & Spilsbury, K. (1998). *Of drops in the ocean and stalactites: Interprofessional education within healthcare settings*. BERA, Queen's University, Belfast. 27–30th August.
- Freeth, D., Hammick, M., Koppel, I., Reeves, S., & Barr, H. (2002). *A critical review of evaluations of interprofessional education*. London, UK: Learning and Teaching Support Network, Centre for Health Sciences and Practice.
- Gilbert, J.H.V., Camp, R.D., Cole, C.D., Bruce, C., Fielding, D.W., & Stanton, S.J. (2000). Preparing students for interprofessional teamwork in health care. *J. Inter-Professional Care*, 14, 223–235.
- Greene, R.J., Cavell, G.F., & Jackson, S.H.D. (1996). Inter-professional clinical education of medical and pharmacy students. *Med. Educ.*, 30, 129–133.
- Hall, P. & Weaver, L. (2001). Interdisciplinary education and teamwork: A long and winding road. *Med. Educ.*, 35, 867–875.
- Hammick, M. (1998). Interprofessional education; concept, theory and application. *J. Interprofessional Care*, 12, 323–332.
- Harden, R.M. (1998). Effective multiprofessional education: A three-dimensional perspective. *Med. Teacher*, 20, 409–416.
- Hayward, K.S., Powell, L.T., & McRoberts, J. (1996). Changes in student perceptions of interprofessional practicing in a rural setting. *J. Allied Health*, 25, 315–327.
- Headrick, L.A., Wilcock, P.M. & Batalden, P.B. (1998). Interprofessional working and continuing medical education. *Br. Med. J.*, 316, 721–730.
- Headrick, L.A., Richardson, A., Priebe, G.P., & Bergman, D. (1998). Continuous improvement learning for residents. *Pediatrics*, 101, 768–773.
- Hilton, R., Morris, J., & Wright, A.M. (1995). Learning to work in the health care team. *J. Inter-Professional Care*, 9, 267–274.
- Horsburgh, M., Lamdin, R., & Williamson, E. (2001). Multiprofessional learning: The attitudes of medical, nursing and pharmacy students to shared learning. *Med. Educ.*, 35, 876–883.
- Horak, B.J., O'Leary, K.C., & Carlson, L. (1998). Preparing health care professionals for quality improvement: The George Washington University/George Mason University experience. *Quality Management Health Care*, 6, 21–30.
- Hughes, J.L., Hemingway, S., & Smith, A.G. (2005). Interprofessional education: Nursing and occupational therapy - could old rivals integrate. *Nurse Education and Practice*, 5, 10–20.
- Koppel, I., Barr, H., Reeves, S., Freeth, D., & Hammick, M. (2001). Establishing a systematic approach to evaluating the effectiveness of interprofessional education. *Issues in Interdisciplinary Care*, 3, 41–49.
- Leathard, A. (1994). *Going inter-professional. Working together for health and welfare*. London, UK: Routledge.
- Luecht, R.M., Madsen, M.K., Taugher, M.P., & Petterson, B.J. (1990). Assessing professional perceptions: Design and validation of an interdisciplinary education perception scale. *J. Allied Health*, 19(2), 181–191.
- MacKinnon, J.L. & MacRae, N. (1996). Fostering

- geriatric interdisciplinary collaboration through academic education. *Physical and Occupational Therapy in Geriatrics*, 14, 41–49.
- Macleod, R.D. & Nash, A. (1994). Multidisciplinary education in palliative care. *J. Inter-Professional Care*, 12, 283–288.
- Makely, S. (1998). *Multiskilled health care workers: Issues and approaches to cross-training*. Bloomington, IN: Pine Ridge Publications.
- Mariano, C. (1999). The case for interdisciplinary collaboration. *Nursing Outlook*, 37, 285–288.
- Mattick, K. & Bligh, F. (2003). Interprofessional learning involving medical students and doctors. *Med. Educ.*, 37, 1008–1011.
- McCroskey, J. & Robertson, P.J. (1999). Challenges and benefits of interprofessional education: Evaluation of the inter-professional initiative at the University of Southern California. *Teacher Education Quarterly*, 26, 69–87.
- McGrath, M. (1991). *Multidisciplinary teamwork*. Aldershot: Avebury.
- McPherson, C. & Sachs, L.A. (1982). Health care team training in U.S. and Canadian medical schools. *J. Med. Educ.*, 57, 282–287.
- Miller, B.K., Ishler, K.J., & Heater, S. (1999). Gerontological initiatives for visionary education project: Interdisciplinary training for occupational and physical therapy students. *Gerontology and Geriatrics Education*, 19, 21–27.
- Mires, G.J., Williams, F.L.R., Harden, R.M., Howie, P.W., McCarey, M., & Robertson, A. (1999). Multiprofessional education in undergraduate curricula can work. *Medical Teacher*, 21, 281–285.
- Mu, K., Chao, C.C., Jensen, G.M., & Royeen, C.B. (2004). Effects of interprofessional rural training on students' perceptions of interprofessional health care services. *J. Allied Health*, 33, 125–131.
- O'Neill, B., Wyness, A., McKinnon, S., & Granger, P. (2000). Partnership, collaboration and course design: A emerging model of inter-professional education. Vancouver, Canada: University of British Columbia. Retrieved May 24, 2005 from the World Wide Web: www.cstudies.ubc.ca/facdev/registry/pacadema.html
- Oxley, A. & Glover, C. (2002). *Occasional Paper 1: Inter-professional education - a brief introduction*. Sheffield, UK: School of Environment and Development, Learning and Teaching Institute, Sheffield Hallam University. Retrieved May 24, 2005 from the World Wide Web: <http://www.bettertogether.ac.uk/resources.cfm>
- Parsell, G., Spalding, R., & Bligh, J. (1998). Shared goals, shared learning: Evaluation of a multiprofessional course for undergraduate students. *Med. Educ.*, 32, 304–311.
- Parsell, G. & Bligh, J. (1999). The development of a questionnaire to assess the readiness of health care students for interprofessional learning (RIPLS). *Med. Educ.*, 33, 95–100.
- Paul, S. & Peterson, C.Q. (2001). Interprofessional collaboration: Issues for practice and research. *Occup. Ther. Health Care*, 15, 1–12.
- Petrie, H.G. (1976). Do you see what I see? The epistemology of interdisciplinary inquiry. *Journal of Aesthetic Education*, 10, 29–43.
- Pew Health Professions Commission. (1994). *Health America: Practitioners for 2005*. San Francisco, CA: Author.
- Poldre, P.A. (1998). *Collaboration in health care: Medical students' perceptions, observations and suggestions*. Toronto, ON: University of Toronto.
- Pollard, K.C., Miers, M.E., & Gilchrist, M. (2004). Collaborative learning for collaborative working? Initial findings from a longitudinal study of health and social care students. *Health and Social Care in the Community*, 12, 346–358.
- Ponzer, S., Hylin, U., Kusoffsky, A., Lauffs, M., Lonka, K., Mattiasson, A.C. & Nordstrom, G. (2004). Interprofessional training in the context of clinical practice: Goals and students' perceptions on clinical education wards. *Med. Educ.*, 38, 727–736.
- Rance, B. (1996). *Proceedings of a conference on interprofessional education and large group teaching in the built environment*. Faculty of the Built Environment, University of Central England.
- Reeves, S., Freeth, D., McCrorie, P., & Perry, D. (2002). 'It teaches you what to expect in the future...': Interprofessional learning on a training ward for medical, nursing, occupational therapy and physiotherapy students. *Med. Educ.*, 36, 337–344.
- Reynolds, F. (2003). Initial experiences of interprofessional problem-based learning: A comparison of male and female students' views. *Journal of Inter-Professional Care*, 17, 35–44.
- Salvatori, P. (1997). Towards developing a flexible health workforce. *Can. J. Occup. Ther.*, 64, 47–52.
- Thomas, K.J., Reigart, E.B., & Trickey, B.A. (1998). An interdisciplinary service learning experience in

- geriatrics for occupational and physical therapy students. *Gerontology and Geriatrics Education*, 19, 81–89.
- Tope, R. (1996). *Integrated interdisciplinary learning between health and social care professions: A feasibility study*. Aldershot, United Kingdom: Avebury.
- Tryssenaar, R., Perkins, J., & Brett, J. (1996). Undergraduate interdisciplinary education: Are we educating for future practice? *Can. J. Occup. Ther.*, 63, 245–251.
- Tucker, K., Wakefield, A., Boggis, C., Lawson, M., Roberts, T., & Gooch, J. (2003). Learning together: Clinical skills teaching for medical and nursing students. *Med. Educ.*, 37, 630–637.
- Tunstal-Pedoe, S., Rink, E. & Hilton, S. (2003). Student attitudes to undergraduate interprofessional education. *J. Inter-Professional Care*, 17, 161–172.
- United Kingdom Central Council for Nursing and Midwifery. (2000). *Fitness for practice and purpose*. London, UK: UKCC.
- Wahlstrom, O. & Sanden, I. (1998). Multiprofessional training ward at Linköping University: Early experience. *Education for Health*, 11, 225–231.
- West, M. (1997). Promoting interprofessional education. *Newsletter of European Network for the Development of Multiprofessional Education in the Health Sciences (EMPE)*, 12.
- White, T. (1989). *Agencies together*. Ilford, United Kingdom: Barnardos.
- Williams, G. & Willson, S. (1998). *The collaborative imperative: Overcoming barriers in health and social care*. Windsor, UK: King George VI & Queen Elisabeth Foundation of St. Catherine.
- Zwarenstein, R., Reeves, S., Barr, H., Hammick, M., Koppel, I. & Atkin, J. (2001). Interprofessional education: Effects on professional practice and health care outcomes. *The cochrane database of systematic reviews*, Issue 3. Art No.: CD002213. DOI: 10.1002/14651858.

Occupational Therapists' Decision Making in Three Therapy Settings in Australia

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Abstract: Can a work setting with its organizational, cultural, and practical considerations influence the way occupational therapists make decisions regarding client interventions? There is currently a paucity of evidence available to answer this question. This study aimed to investigate the influence of work setting on therapists' clinical reasoning in the management of clients with cerebral palsy and upper limb hypertonicity. Specifically the study aimed to examine therapists' objective and stated policies, and their intervention decisions using Social Judgement Theory methodology. Participants were 18 occupational therapists with more than five years experience with clients with cerebral palsy who were asked to make intervention decisions for clients represented by 90 case vignettes. They worked in three settings, hospitals (5), schools (6), and community (6). One participant from private setting was not included in the analysis because of lack of participants in this setting. The results indicated that therapy settings did influence therapists' decisions about intervention choices but not their objective and subjective policy decisions.

Key words: therapy setting, clinical reasoning, cerebral palsy, social judgment theory

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Introduction

Clinical reasoning or thinking associated with clinical practice is the fundamental cognitive process used by therapists to plan, direct, perform, and reflect upon client care (Chapparro & Ranka,

2000; Schell, 1998). It has been suggested that the setting in which therapists work may influence their clinical reasoning, (Barnitt & Partridge, 1997), facilitate or inhibit certain intervention choices (Schell & Cervero, 1993) and consequently influence therapy outcomes for clients (Chapparro & Ranka, 2000).

Therapy setting refers to the place in which a therapist works and provides services. The practice model adopted in different settings may, by its very nature, impact decision making. For example, therapists working in hospitals may be influenced by the medical model (Fleming, 1991a, 1991b). Furthermore, within hospital settings

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doctors can influence therapists' decision making as they retain the overall responsibility for client treatment (Crabtree & Lyons, 1997). Subjective norms, however, can also influence therapists' decision making. Subjective norms include therapists' perceptions of the expectations of other occupational therapists, as well as those of clients and carers. These perceptions can generate a motivation to want to fulfill these expectations (Chapparo, 1997).

Barnitt and Partridge (1997) reported that therapy settings influenced experienced occupational therapists' ethical reasoning. Therapists in their study were influenced by the approval of others. In contrast, Feder, Majnemean, and Synnes (2000) did not find that work settings influenced the treatment approach chosen by 50 pediatric occupational therapists who had more than three years of clinical experience. There are two possible reasons for these discrepant findings. First, the former study examined ethical reasoning, which is a type of clinical reasoning, while the later focused on therapists' treatment choices that are the end product of therapists' decision making processes. Second, the studies employed different research methods. While Barnitt and Partridge (1997) employed a phenomenological method relying on observation and interview, Feder, Majnemean, and Synnes (2000) used a quantitative approach based on a questionnaire.

To date no studies have attempted to determine the effects of therapy settings on different aspects of therapists' decision making such as the information used by therapists, and the intervention options recommended for their clients. Understanding what information is used by therapists in their decision making in different settings can help identify the specific assessment and evaluation procedures considered important and result in more effective use of time. If intervention strategies chosen by occupational therapists for their clients vary on the basis of clinical setting then it also brings into question the issue of best practice. Social Judgment Theory (SJT) method seems to be appropriate in studying information used and intervention choices employed by occupational therapists in their decision making.

Social Judgment Theory (SJT) is a cognitive decision making theory (Doherty & Kurz, 1996) which is most relevant in situations where no optimal decision exists (Cooksey, 1988). There are two assumptions underlying the nature of decision makers' thinking processes in SJT. First, any decision must be based on pieces of information or factors (Cooksey & Freebody, 1986). Second, decision makers integrate these factors and synthesize them, trade off factors against one another, set limits for factors, select and attend to only those factors having perceived importance to arrive at their final decisions (Hammond, 1978, 1981 cited in Cooksey & Freebody, 1986). In other words, decision makers are influenced by the specific features of the problem confronting them. In this process they differentially weigh factors in their clinical reasoning and this is called strategy or policy capturing (Wigton, 1996). This process is not entirely analytical, that is applying mathematically logical rules, but largely intuitive based on clinicians' hunches, impressions, and feelings (Hammond, 1996). Two kinds of policies are identified in SJT: objective (statistical) and stated (subjective) policies (Cooksey, 1996a). Objective policy is based on intuitive aspects of cognition and refers to identified levels of importance attached to the factors or how therapists actually use factors (information) in their decision making. Objective policies are identified when a large number of case vignettes or real cases are developed and presented to the decision makers who are then required to respond to a clinical question. General linear analysis is used to analyse the relationship between the factors (information) presented in the cases and the person's response and this determines what has been called the statistical factor weights (Cooksey, 1996b). Stated policies, on the other hand refer to an individual's stated impressions of levels of importance (weights) attached to factors or how they think they use factors (information) when they make decisions. It is based on the analytical aspects of cognition and identified when the factors are presented to the decision makers who are then asked to identify a factor's weight (e.g., by factor ranking). In the present study, we

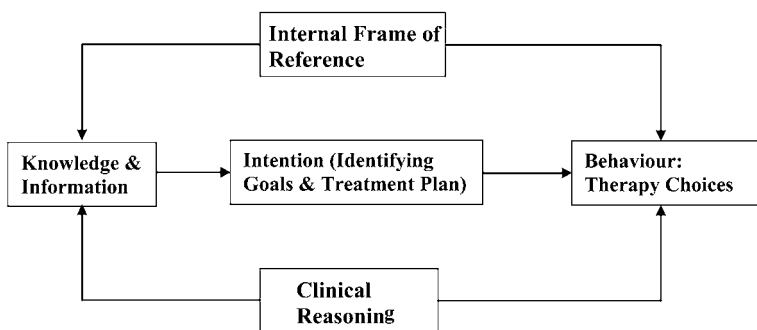


Fig. 1. A simple model in clinical reasoning (Chapparo, 1997)

examine the impact of therapy settings on therapists’ decision making in the management of clients with cerebral palsy and upper limb hypertonicity in terms of therapists’ objective and stated factor weights, as well as therapists’ intervention choices.

The management of upper limb hypertonicity of clients with cerebral palsy (CP) was chosen as the focus of this study for two main reasons. First, the incidence of CP is high, manifesting in between 1.4 and 2.4 of 1000 live births (Parkes, *et al.* 2001; Pirpiris & Graham, 2001; Sanger, 2003). Second, people with CP are one of the major client groups referred to occupational therapy clinics as outpatients (Dudgeon, 2001).

Chapparo’s frame of reference (1997) is used to further clarify the aims of this study. She suggested a model for therapists’ clinical reasoning within a personal internal frame of reference. She proposed that knowledge related to context, clients, other professionals, intervention as well as self-beliefs and professional beliefs produced the knowledge content of clinical decision making and these all form a complex personal internal frame of reference. Therapists use this knowledge within the internal frame of reference to build a “personal theory for each clinical encounter. She suggested that this frame of reference manages clinical judgments. Figure 1 illustrates Chapparo’s model in which the relationship between the internal frame of reference and clinical reasoning is shown. This study focused on weights attributed to knowledge and information (factors) in two ways including

objective and stated policies, and therapists’ intervention choices.

Method

This study used the capacity of SJT to investigate and understand the impact of therapy settings on individual therapists’ decision making policies and their intervention choices in the management of upper limb hypertonicity in clients with CP.

Task development

On the basis of a comprehensive literature review, discussion with two expert therapists, and a survey of 12 further experienced clinicians, 12 factors were considered to be influential when therapists make decisions in the management of upper limb hypertonicity of clients with CP (see Table 1). These factors were the basis for the development of case vignettes used in this study. First, factors were defined and measurement scales for each determined. The 12 identified factors and their scales of measurement formed the basis of the information used to develop 10 sample case vignettes. A manual containing instructions for answering the case vignettes, as well as the factor definitions and the scales of measurement was also developed to provide appropriate information for therapists. The manual included three sections. The first section provided information about the process of identifying the factors. The second section included explanations about the identified factors and their scales of measurement. The last

section comprised a sample case vignette and study questions (Rassafiani, 2006).

Therapists were asked to identify the most appropriate treatment method for the client represented in the case vignettes among seven choices that were ordered on the basis of how invasive they might be considered: no therapy, hands-on approach, splinting, constraint-induced movement therapy, casting, refer for Botulinum Toxin Type A (BTX-A), and refer for surgery. These intervention options were based on the work of Copley and Kuipers (1999).

A pilot study was conducted with four experienced occupational therapists to determine: (1) whether the administration manual (i.e., the factor definitions, and the scales of measurement) was readily understood; (2) if the sample case vignettes were perceived as realistic; and (3) the time requirement for reading the manual and answering case vignettes was acceptable. The pilot study enabled the administration manual and case vignettes to be refined enabling the next phase to proceed which was the generation of case vignettes for this study.

The statistical program SPSS version 11 was used to help generate random values for each of the factors included in the case vignettes. In generating the data, a uniform distribution was chosen for each factor in which the values ranged from the lowest to the highest to make sure that there would be a wide spread in the final selected case vignettes mimicking the real world. Four hundred case profiles were generated and these were then reviewed by two occupational therapists experienced in the management of upper limb hypertonicity as well as the research team to exclude implausible client profiles. From the original 400, 90 case vignettes that were considered to be representative of real clients (see Appendix A for an example). This was considered a reasonable numbers of case vignettes to use in judgment analysis (Cooksey, 1996a).

All chosen case vignettes were collated into a booklet. The booklet was bound and accompanied by the manual guiding the participants in how to answer case vignettes. Moreover, the manual contained explanations and definitions of the factors along with their scales of measurement.

Procedure

Ethical approval was gained from The Behavioural and Social Sciences Ethical Review Committee (BSSERC), The University of Queensland. All questionnaires, answer sheets, and demographic information were labelled with appropriate codes related to participants and kept in a locked filing cabinet. When a participant agreed to take part in the study, an appointment was made for two and half hours at her/his convenience. During the meeting the participants were told about the study and the process of identifying the factors, their scales of measurement, and their definitions, as well as development of the case vignettes. Then, they were asked to read the manual and make interventions choices for three example case vignettes. In the meantime, any queries regarding the various aspects of the study were clarified. They were then provided with the case vignettes booklet and an answer sheet and asked to complete 90 case vignettes. They could refer to the manual when they were answering the questions. Refreshments were provided during a break after they completed the first 60 case vignettes. When they finished all the case vignettes they were asked to rank in order of priority the 12 identified factors of the study. These factors were written on individual cards which participants could manipulate until they were satisfied with the order.

Participants

Occupational therapists with more than five years experience with clients with CP working in central and south-east Queensland (Australia) were invited to participate in this study. They had to satisfy the following criteria: (a) have a minimum qualification of a Bachelor of Occupational Therapy; (b) possess additional formal training (such as workshops or courses on CP); and (c) be acknowledged by professional colleagues as having experience in the management of upper limb hypertonicity in children and adults.

Participants were recruited by advertising in the Occupational Therapy Australia QLD Newsletter; distributing flyers about the project to paediatric interest groups; and by snowball

sampling. Eighteen occupational therapists (16 females and 2 males), mean age of 36.7 years (SD=7.6 years) who had worked with people with CP for a mean of 10.4 years (SD=6.0 years) participated. All possessed a Bachelor degree in occupational therapy and one had a PhD. On average, the participants had attended 5.8 (SD=3.1) continuing education workshops (e.g., NDT, sensory integration, and conductive education). Participants worked in various settings including: (a) five in hospitals; (b) six in schools; and (c) six in the community. One participant was from the private sector and was not included in the subsequent analysis.

Statistical Methods

Data from the answer sheet and therapists' decisions for the 90 case vignettes were analysed using Chi-square test to determine whether the therapists' work setting (i.e., Hospital, school, or community) influenced the intervention choices favoured. Multiple linear regression models were employed to examine therapists' objective policies. To examine the relative importance of the factors the square semi-partial correlations for 12 factors resulting from multiple linear regression models were used and the relative weighting of the factors were identified by the following equation.

$$RW_{ui} = \frac{sr^2}{\sum sr^2}$$

RW is the objective weight and sr^2 is the square semi-partial correlation resulting from the linear regression coefficient (Cooksey, 1996a). The results show how therapists have used factors to decide about the management of upper limb hypertonicity for clients with CP. In addition, to examine stated relative weights of factors influencing therapists' decision making, the SMARTER (Simple Multi-Attribute Rating Technique Extended to Ranking) procedure was employed (Barron & Barrett, 1996). Participants ranked the twelve judgment factors used in the study from 1 to 12 with 1 being the most important and 12 the least. Then, by using the SMARTER, stated weights were calculated for each factor. Finally, One-way Analysis of Variances

(ANOVA) was carried out to determine whether there was any significant difference in therapists' objective and stated policies in respect to their work settings.

Results

Intervention choices

Figure 2 reports the percentage of therapists who chose specific interventions based on their work settings. The Chi-square test showed that therapists' treatment choices were significantly different ($\chi^2=399.9$, $df=12$; $p=0.000$).

Inspection of Fig. 2 reveals that hands-on techniques, splinting, casting, and referral for BTX-A injection were the main treatment choices within all settings. While hands-on techniques and splinting were the most commonly chosen intervention methods for participants working in the school settings, splinting and casting were mainly chosen by participants in community settings. Intervention choices favoured casting and referral for BTX-A for participants working in hospitals. Intervention methods including no-therapy, CIMT, and referral for surgery were chosen less frequently than other methods and their percentages among the three groups of participants were comparable.

To further clarify the differences in treatment choices depending on settings, CIMT was removed from the analysis. CIMT was among the least favoured treatment options and this may be reflective of its clinical novelty. Figure 3 illustrates the treatment choices after removal of the CIMT option. The treatment choices for therapists practicing at schools were hands on techniques and splinting, this shifted to casting for therapists working in the community setting and referral for BTX-A injections for those working in hospitals. These differences were statistically significant ($\chi^2=384.1$, $df=10$, $p=0.000$).

Therapists' objective and stated policies

The objective policies of the participants working in the three therapy settings were then compared using ANOVA. The results revealed no statistically significant differences among groups in relative weights for the 12 factors of the study.

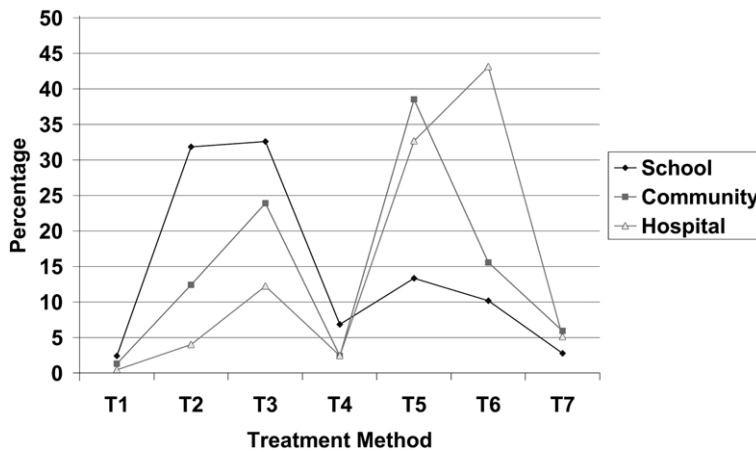


Fig. 2. The frequency of treatment methods chosen by therapists based on work settings
 Note. T1: No therapy; T2: Hands-on techniques; T3: Splinting; T4: Constraint-induced movement therapy (CIMT); T5: Casting; T6: Referral for BTX-A injection; T7: Referral for surgery.

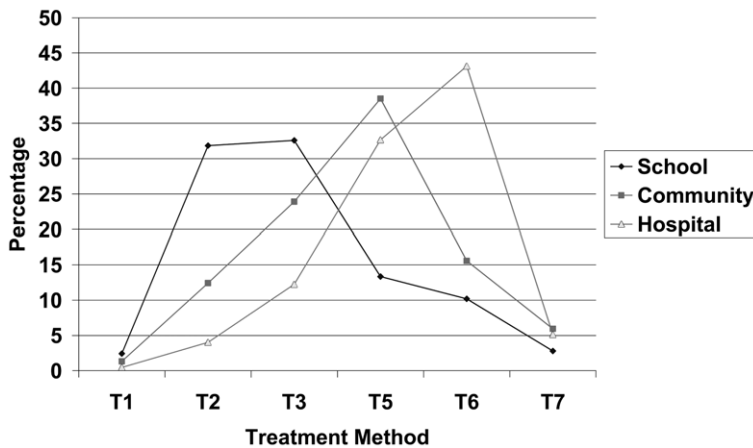


Fig. 3. The frequency of treatment choices by therapists in three setting with removal of constraint-induced movement therapy as an option
 Note. T1: No therapy; T2: Hands-on techniques; T3: Splinting; T5: Casting; T6: Referral for BTX-A injection; T7: Referral for surgery.

The *p* values for all factors were more than the critical value of 0.05 (df=2, 14). Table 1 summarizes these results.

ANOVA was used to examine whether there was any difference in the stated relative weights of

factors among the three groups. Results indicated no statistically significant difference among the three groups. The *p* values ranged between 0.2 and 0.99 for the twelve factors (Table 2).

Table 1. Comparison of objective policies of therapists working in three work settings

Factor	Community		School		Hospital		<i>F</i>	<i>p</i>
	Mean	SD	Mean	SD	Mean	SD		
Age	5.7	5.8	18.5	23.4	1.4	1.7	2.1	0.15
PT ¹	4.5	3.7	3.5	4.1	12.2	12.6	2.1	0.15
OG ²	10	20.2	1.7	2.4	2.2	2.2	0.9	0.45
SS ³	15.3	16	23.5	28.6	45.8	13.7	3	0.08
LP ⁴	2.3	3.1	2.8	2.1	5	5.6	0.8	0.49
LA ⁵	4.2	5.7	6.3	9.6	1.2	1.6	0.8	0.47
LD ⁶	2	2.4	1.8	1.6	5.6	5.9	1.8	0.2
WFP ⁷	10.8	7.2	23	31.8	4	3.8	1.3	0.29
TP ⁸	4	5.1	2.5	1.9	11.2	9.3	3.3	0.07
PC ⁹	5.3	5.7	3.3	3.6	5.2	6.1	0.3	0.77
AM ¹⁰	16	14.4	5.2	8.8	4.8	6.7	2	0.17
FB ¹¹	19.5	24.4	7.8	11.6	1	1.4	1.9	0.19

Note. ¹Previous Treatment; ²Occupational Goals; ³Severity of Spasticity; ⁴Limitation in Passive Range of Movement; ⁵Limitation in Active Movement; ⁶Limitations in Developmental Gross Movement; ⁷Wrist and Finger Posture; ⁸Thumb Posture; ⁹Practice Context (time limitation, treatment priority); ¹⁰Associated Medical Factors; ¹¹Client & Family Background.

Table 2. Comparing stated policies of therapists working in three therapy settings

Factor	Community		School		Hospital		<i>F</i>	<i>p</i>
	Mean	SD	Mean	SD	Mean	SD		
Age	8.1	6.3	12.1	11.1	8.3	5.4	0.46	0.64
PT ¹	5.6	4.7	5.3	4.1	5.5	3.4	0.01	0.99
OG ²	16.7	8	18.3	7.5	16.9	8.4	0.07	0.93
SS ³	13.8	7	14	6.6	15.2	7.8	0.07	0.94
LP ⁴	7.5	3.4	10.4	8.9	11.3	5.1	0.57	0.58
LA ⁵	9.7	3.4	9	6.8	8.3	3.2	0.11	0.89
LD ⁶	2.6	2	2	1.9	1.7	1.1	0.43	0.66
WFP ⁷	4.6	3.4	8.5	6.1	4	1.7	1.9	0.19
TP ⁸	3.8	2.8	5.2	2.6	4.6	1.5	0.53	0.6
PC ⁹	3	2.3	6	2.6	6.5	10.8	0.54	0.59
AM ¹⁰	13.2	11.3	3.3	2.4	7.6	10.7	1.84	0.2
FB ¹¹	11.7	10	6.1	4.8	10.2	7	0.86	0.44

Note. ¹Previous Treatment; ²Occupational Goals; ³Severity of Spasticity; ⁴Limitation in Passive Range of Movement; ⁵Limitation in Active Movement; ⁶Limitations in Developmental Gross Movement; ⁷Wrist and Finger Posture; ⁸Thumb Posture; ⁹Practice Context (time limitation, treatment priority); ¹⁰Associated Medical Factors; ¹¹Client & Family Background.

Discussion

Participants in this study were employed in one of three clinical settings—hospital, school, or community. When asked to identify influential factors in their decision making therapists regardless of work settings chose similar factors.

Therapists in the three work settings were also similar in their objective policies. However, even though they identified similar factors as being influential they varied in how they used this information when determining the intervention choices for clients represented in the case vignettes.

The most frequently identified interventions by participants working in school settings were hands-on techniques and splinting. For therapists working in community settings, splinting and casting were the primary choices, while for those working in hospitals, casting, and referral for BTX-A injection were preferred. Paradoxically, however, these variations did not significantly influence therapists' objective and stated policies. Ryan (2000) has stated that the focus of health care is predominantly intervention and medical strategies in hospitals and that this changes towards prevention and social ways of working in community and school settings. Therefore, different thinking and clinical reasoning for these settings is required. On the basis of studies in medicine and nursing, she further divided aspects of clinical reasoning into generalized (e.g., interpersonal skills, technical skills, selection of data) and specific (e.g., problem solving, number of hypothesis, physical examination) to the setting. The findings of this study seem to support Ryan's (2000) proposition.

The results of this study are in contrast to those of Feder, Majnemean, and Synnes (2000) in which they concluded that work settings did not influence choice of treatment approach for 50 pediatric occupational therapists with more than three years of experience. This might be due to the differences in the methods of these studies. Both studies employed quantitative methods, however, this study used case vignettes to explore the intervention options, but Feder *et al.* employed a questionnaire asking directly about intervention methods.

Several reasons might help explain the various interventions used by therapists in different clinical settings. Chapparo (1997) stated that "therapists were less likely to participate in therapy that was perceived by them to be 'difficult' or 'impossible' in their particular work context" (p.333). Participants working in hospitals could have been more influenced by the medical context of their setting (Mattingly, 1994). Fleming (1991a, 1991b) suggested two other reasons why therapists are strongly influenced by the medical model: the type of education they have received, and their exposure to medical lectures

and case studies. Occupational therapy education may therefore encourage therapists to employ the medical model. This may have been the case particularly for therapists who trained more than five years ago. Moreover, the medical model is easy to understand as it includes concrete information and therapists can follow the procedures in a step by step method; such a model is used in scientific reasoning (Chapparo & Ranka, 2000). Therapists working in hospitals also usually take part in lectures and case discussions run by physicians such as in grand rounds. This may also increase their knowledge about medical interventions and consequently influence their own intervention choices.

The concept of subjective norms is another influential factor in clinical decision making (Chapparo, 1997). Subjective norms refer to "the perceived social pressure to perform or not to perform various forms of therapy" (Chapparo, 1997: p. 279). Subjective norms evolve from: (1) therapists' perceptions of the expectations of other occupational therapists, and (2) therapists' perceptions of clients' and carers' expectations and can result in a motivation to fulfill these expectations. In this research, subjective norms relating to specific settings may have influenced therapists in choosing particular intervention options. In the schools, occupational therapists mostly had interactions with teachers, physical therapists and speech and language pathologists, while in hospitals this extended to nurses, and doctors. In each setting, therefore different professionals had various expectations and could potentially influence therapists' choice of interventions. Finally, difference in therapists' intervention choices may not be related to therapy settings but therapists may simply choose to work in settings consistent with their view of health care, or a combination of these factors may cause differences.

Limitations and future research

For the participants in this study place of employment impacted intervention choices. This means that for the same client, different clinical decisions were made if therapists were in different settings. In other words, if a client obtained advice

from an occupational therapist in a school setting, this might be different from the intervention advice of a therapist who worked in a hospital setting. If a client goes to different settings and receives different suggestions, this may produce conflict in choosing the most appropriate intervention methods. However, because of the small numbers of participants in this study this issue requires further investigation to examine what currently happens with those clients who are referred to different settings.

This study was conducted with the case vignettes. Further investigation with real clients would help to clinically understand the influence of therapy setting on therapists' decisions.

Conclusion

This study found that therapists' intervention strategies were influenced by the therapy setting in which they were employed. In contrast, objective and stated policies remained statistically similar across settings. These findings suggest that different processes are at work in the clinical decisions made by therapists depending on their place of employment. Understanding the impact of therapy settings on therapists' decision making is an important consideration when looking at best practice. In this study therapists in three settings used different intervention options for clients. It is necessary to do further study with therapists in other settings and investigate the influences of therapy settings on all aspect of therapists' clinical reasoning.

Acknowledgment

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References

- Barnitt, R., & Partridge. (1997). Ethical reasoning in physical therapy and occupational therapy. *Physiotherapy Research International*, 2(3), 178–192.
- Barron, F. H., & Barrett, B. E. (1996). The efficacy of SMARTER - simple multi-attribute rating technique extended to ranking. *Acta Psychologica*, 93, 23–36.
- Chapparo, C. (1997). *Influences on clinical reasoning in occupational therapy*. Unpublished PhD, Sydney, Australia: Macquarie University.
- Chapparo, C., & Ranka, J. (2000). Clinical reasoning in occupational therapy. Higgs J. & Jones M. (eds.), *Clinical reasoning in health professions* (pp. 128–137). Oxford: Butterworth Heinemann.
- Cooksey, R. W. (1988). Social judgment theory in education: current and potential applications. Brehmer B. & Joyce C. R. B. (eds.), *Human judgment: the SJT view* (pp. 273–315). Amsterdam: North-Holland.
- Cooksey, R. W. (1996a). *Judgment analysis: theory, method, and applications*. San Diego: Academic press.
- Cooksey, R. W. (1996b). The methodology of social judgment theory. *Thinking and Reasoning*, 2(2/3), 141–173.
- Cooksey, R. W., & Freebody, P. (1986). Social judgment theory and cognitive feedback: a general model for analyzing educational policies and decisions. *Educational Evaluation and Policy Analysis*, 8(1), 17–29.
- Copley, J., & Kuipers, K. (1999). *Management of upper limb hypertonicity*. San Antonio, TX: Therapy Skill Builders.
- Crabtree, M., & Lyons, M. (1997). Focal points and relationships: a study of clinical reasoning. *Br. J. Occup. Ther.*, 60(2), 57–64.
- Doherty, M. E., & Kurz, E. M. (1996). Social judgment theory. *Thinking and Reasoning*, 2, 109–114.
- Feder, K., Majnemer, A., & Synnes, A. (2000). Handwriting: Current trends in occupational therapy practice. *Can. J. Occup. Ther.*, 67(3), 197–204.
- Fleming, M. H. (1991a). Clinical reasoning in medicine compared with clinical reasoning in occupational therapy. *Am. J. Occup. Ther.*, 45(11), 988–996.
- Fleming, M. H. (1991b). The therapist with the three-track mind. *Am. J. Occup. Ther.*, 45, 1007–1014.
- Hammond, K. R. (1996). *Human judgment and social policy: irreducible uncertainty, inevitable error, unavoidable injustice*. New York: Oxford University Press.
- Mattingly, C. (1994). Occupational therapy as a two-body practice: body as machine. Mattingly C. &

- Fleming M. H. (eds.), *Clinical reasoning: forms of inquiry in a therapeutic practice*. (pp. 37–63). Philadelphia: FA Davis.
- Rassafiani, M. (2006). *Occupational therapists' decisions about the management of upper limb hypertonicity in children and adolescents with cerebral palsy*. Unpublished PhD, Brisbane: University of Queensland.
- Ryan, S. (2000). Facilitating the clinical reasoning of occupational therapy students on fieldwork placement. Higgs J. & Jones M. (eds.), *Clinical reasoning in the health professions* (2nd ed., pp. 242–248). Oxford: Butterworth-Heinmann.
- Schell, B. B. (1998). Clinical reasoning: the basis of practice. Neistadt M. E. & Crepeau E. B. (eds.), *Willard and Spackman's occupational therapy* (9th ed., pp. 90–100). Philadelphia: Lippincott-Raven Publishers.
- Schell, B. B., & Cervero, R. M. (1993). Clinical reasoning of occupational therapy: an integrative review. *Amer. J. Occup. The.*, 47, 605–610.
- Wigton, R. S. (1996). Social Judgment theory and medical judgement. *Thinking and Reasoning*, 2(2/3), 175–190.

