TRAINING OBSERVATIONAL SKILLS FOR IDENTIFYING BABIES WITH CEREBRAL PALSY

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ABSTRACT
Diagnosis of cerebral palsy is acknowledged to be difficult, with some cases remaining unidentified until two years of age. This study aimed to determine whether a training video enhanced health professional's ability to identify abnormal motor signs in babies, which might indicate cerebral palsy. A within groups comparison using repeated measures was used. Twenty-nine health visitors and 29 doctors were recruited and subjects recorded any abnormal motor signs seen in babies on two assessment videos, one seen before and one after a training videotape. Analysis was by non parametric statistics. The probability value for statistical significance was set at 5% ($p<0.05$). After seeing the video, groups improved significantly in their ability to detect signs of abnormal movement: health visitors $p=<0.002$; doctors $p=<0.000$. Health visitors' rates of correct diagnoses remained unchanged, but doctors showed an increase in incorrect diagnoses of normal babies after seeing the video $p=0.013$. The training video appears effective in improving the ability of general practitioners (and trainees) and health visitors, to detect abnormal movement in videotapes of babies, over the short term. It does not appear to effect a positive change in diagnosis rates in this training situation.

INTRODUCTION

Early Treatment of Cerebral Palsy

There is a widely held view that early treatment can mitigate against the effects associated with Cerebral Palsy[1] and can lead to greater developmental progress[2]. However, late diagnosis is a problem in a significant percentage of children, with some remaining unidentified until the age of 2 years. Abnormal movement patterns may then be habitual and deformities may have developed[3].

Difficulty of Diagnosis

Many factors contribute to the acknowledged difficulty of diagnosing cerebral palsy. Prevalence of cerebral palsy is 2 to 2.5:1000 live births[4]. Due to low prevalence, there is little opportunity for general practitioners or health visitors to practise diagnostic skills. Although both professions would usually refer on to a child development centre and/or paediatrician for final diagnosis, the initial suspicion of a diagnosis is often identified by those professions working in primary care. The average general practitioner sees one to two new children with cerebral palsy in their working life and the average health visitor sees one new baby every 5-10 years[5]. Time allocated to the professions for training in developmental surveillance is limited, so emphasis is on normal child development and common treatable conditions[5].

Cerebral palsy is an 'umbrella' term, which includes many different motor disorders with different aetiologies, all grades of severity, and a wide variety of

cognitive ability. There are no accepted minimal diagnostic criteria, that is, no specific criteria have been identified which if present, indicate that cerebral palsy is definitely present. Substantial between and within observer diagnostic variability has been demonstrated[6].

Methods of assessment which may lead to a diagnosis can include taking a history, checking milestones and physical examination, including eliciting reflexes and assessing tone. In suspected cases of cerebral palsy, the history does not always help to confirm or refute suspicion. Risk factors known to be associated with a higher incidence of cerebral palsy include the complications of extreme prematurity such as low birth weight and intra-ventricular haemorrhage[7]. Also there are perinatal risk factors such as prolapsed umbilical cord, breech birth and birth asphyxia[7]. However, the majority of children with such risk factors will not turn out to have cerebral palsy. Therefore, giving too much weight to a history including several risk factors could lead to over diagnosis. Conversely, up to 21% of cases of cerebral palsy have no clear aetiology, which due to the lack of clear risk factors can lead to under diagnosis[8].

The importance of achievement or delay in attaining motor milestones can be over emphasised or misinterpreted, respectively. There is a wide distribution of age during which acquisition of a motor skill is within normal limits[9]. Most late walkers do not have cerebral palsy and conversely many children with cerebral palsy achieve their early milestones within the time designated as 'normal'. Ignoring how a milestone is achieved may lead to overlooking pathology. For example, a baby may lift it's head up whilst in prone at the appropriate age, however, if it's head is abnormally high or other aspects of motor development are delayed, this may be due to an increase in abnormal extensor muscle tone indicative of a neurological problem [10].

The assessment of primitive reflexes are often a part of the diagnostic process. However, primitive reflexes as a group, 'are the least reliable and valid predictors of later motor handicap' [11] (p339).

Standardised developmental tests such as the Griffiths Locomotor assessment and the Denver Developmental Screening assessment are occasionally used in primary care, but time limitations exist for training and using a test does not guarantee effective developmental surveillance[12, 13].

Many authors agree that analysis of movement which deviates from the norm is of greater diagnostic value than assessment of muscle tone and primitive reflexes alone[12, 14, 15]. Observation of the spontaneous movements of the premature[16] and term infant[17] have been used as a diagnostic tool. A stronger correlation between later abnormal neurological outcome and movements identified as being abnormal, than with neurological examination[17] or ultrasound scan results has been found[16]. Skills in observing the difference between normal and abnormal movement in infants are perhaps those skills where there is least opportunity for practice for health professionals. Video instruction might prove a useful training tool.

Use of Video for Training Purposes

The use of video has been shown to be more effective than traditional methods of teaching in improving retention and developing clinical skills[18, 19, 20]. Medical students receiving video instruction, in addition to or instead of other media, e.g didactic lecture or audiotapes, showed greater improvement in their interpretation of abnormal movements, greater diagnostic reliability of rare neurological conditions and demonstrated improved clinical skills [21, 22, 23].

The purpose of this study was to determine whether the use of an educational video was effective in enhancing health professionals' ability to identify babies with abnormal motor signs.

METHOD

Subjects

A geographically convenient sample was used, consisting of groups of health professionals who met for continuing professional development: 29 health visitors from two South London Primary Health Care Trusts who met in two different groups for training; 14 general practitioners with between 1 and 5 years experience, who met for training at a hospital in South West London and 15 general practitioner trainees who met for training at a South London Post Graduate Medical Centre. The aim was to recruit an equal number of health visitors and general practitioners, but this did not prove possible. Therefore, general practitioner trainees were recruited, although it was recognised that they would have less experience than the general practitioners. All subjects approached gave verbal consent following explanation of the study.

Equipment

The training video was entitled "Early Infant Assessment Redefined", which included observations of movement in two six month old babies, one showing normal and one abnormal movement. The babies were seen in eight positions: supine, side lying, prone, pull to sit, sitting, standing, ventral suspension and protective extension within this last position. The video demonstrated the abnormal movement signs, which are considered to be predictors of neurological abnormality [24, 25].

A pre-intervention questionnaire was devised which asked about training and experience of cerebral palsy. It also asked subjects to rate their current overall level of confidence regarding their ability to identify a baby with suspected cerebral palsy, using a visual analogue scale ranging from 0 to 100% confident.

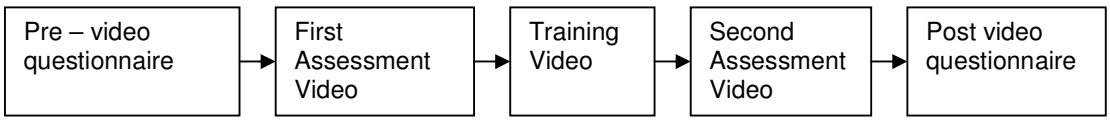
Two assessment videos (A & B) were produced using five babies with no known or suspected diagnosis of cerebral palsy or other movement disorder (aged 3 - 7 months), and six babies (aged 7-14 months) with a known or suspected diagnosis of cerebral palsy. The discrepancy in ages of the groups (corrected for prematurity), allowed all babies to be at similar developmental stages. Care was taken to ensure that the babies with a suspected diagnosis of cerebral palsy were not significantly larger in weight or height. This did not present a significant problem as many of these babies had been premature or

of low birth weight. Each video contained two minute vignettes of seven babies, three showing normal movement and four abnormal movement, in a random order. The videos were subject to peer review by three paediatric physiotherapists and deemed appropriate for the purpose. On viewing the videos at this stage they appeared to be of equal difficulty: there were a similar number and type of abnormal signs present in the babies on each video. The abnormal motor signs most apparent in each baby were recorded and a scoring system devised. For each baby, subjects recorded any observed abnormal movements, in each of eight positions. Separate scores were given for each correctly identified sign and each misinterpreted sign (where normal movement was interpreted as abnormal). Also recorded were judgements as to whether the subject suspected each baby's overall movement of being normal or abnormal. This information was recorded on a specially devised form. A post experiment questionnaire asked subjects about their opinion of the training video on a 7 point Likert scale (strongly agree:1, to strongly disagree:7) as to whether they considered the video useful, interesting, informative, well structured and clinically applicable. It also repeated the visual analogue scale rating their current overall confidence regarding their ability to identify a baby with suspected cerebral palsy. Subjects were not reminded of their previous self assessed confidence level.

Experimental design

The data were analysed using a within groups comparison of repeated measures. The first set of measures recorded for each group acted as their own control. Subjects received the initial questionnaire about their training and recorded any signs of abnormal movement while watching the first assessment video. They then watched the training video and recorded signs of abnormal movement while watching the second assessment video and then completed the final questionnaire. Figure 1 illustrates the project design.

Figure 1: Plan of Project



Change was expected in the number of identified abnormal movements pre and post viewing the training video. Change was not expected in the number of correctly diagnosed babies since there were only a few babies with cerebral palsy on each assessment video. In addition, health professionals' were aware that the teaching session was about identifying children with possible cerebral palsy. Therefore, alertness was raised to look for cerebral palsy, which might result in some bias with professionals' identifying more babies at baseline than would otherwise be anticipated.

Procedure

Training sessions took place at the professionals' training centres during their usual designated training time for continuing professional development. Typical training session times were as follows: health visitors = 2 hours, general practitioner trainees = 1½ hours, and general practitioners = 1 hour

15 minutes. The procedure was expected to take 1 hour 10 minutes. Subjects were asked not to talk during collection of data, except asking for clarification regarding the procedure. Health visitor training sessions took place within the same week and general practitioner trainee and general practitioner training sessions took place a fortnight later, but on different days.

Ethical Issues

Ethical approval was sought from Queen Mary's University Hospital and the Roehampton Institute, University of Surrey, but was not deemed necessary as no research was taking place on the babies. Informed written consent was sought from all parents of babies that were filmed for the study. An information letter and consent form for parents were approved by the ethical committees, stating that if parents chose to participate, a video would be made of their baby's movement and this would only be used for the above purpose. Following explanation of the study, verbal consent was sought from the health professionals participating in the study.

Analysis

Data from the pre and post-intervention questionnaires were largely nominal or ordinal (Likert scales). The data from the assessment videos (number of abnormal signs and the number of misinterpreted signs recorded for each baby) were also ordinal. Descriptive statistics were used to display the range and variability of data. Non-parametric statistics were also used: the repeated measures data were analysed with the Wilcoxon Signed Rank Test. Each of the four groups was analysed separately. However, to avoid any order effect from the two assessment videos, the order was varied with one general practitioner & one health visitor group seeing Video A then Video B and the other groups vice versa. Therefore, the primary analysis looked at health visitors as one group and general practitioners and general practitioner trainees as another group, although it was recognised that there might be some variation in experience within the general practitioner/ general practitioner trainee group. No specific evidence was found to suggest that the various professions would have more or less skill in identifying abnormal movement or diagnosing possible cases of cerebral palsy. If any differences had been detected, these would have been subject to further analysis.

RESULTS

Data were collected from a total sample of 14 general practitioners, 15 general practitioner trainees and 29 health visitors (seen in two different groups (group 2, n=12; group 3, n=15). Two health visitors were present for only part of the sessions, so were excluded from analysis. Previous training and experience of being the first health professional to suspect a diagnosis of cerebral palsy is illustrated in table one. General practitioners (n=11) and general practitioner trainees (n=12) had received similar amounts of training by lecture, which exceeded that of health visitors (n=5). Practical training had been received by six general practitioners and six general practitioner trainees but only two health visitors. However, more health visitors (n=8) had had the experience of being first to suspect a diagnosis of cerebral palsy in a child, whereas only two general practitioners and one general practitioner trainee had had this experience.

Table 1: Training and Experience of Health Professions

Professions	Lecture on CP during training	Practical training session during training	1st to suspect a diagnosis of CP
HVs (n=27)	5 (17%)	2 (7%)	8 (27%)
GPs (n=14)	11 (79%)	6 (43%)	2 (14%)
GP Trainees (n=15)	12 (80%)	6 (40%)	1 (7%)

Correct and misinterpreted signs, correct and incorrect diagnoses are displayed for the whole group of health visitors and the group containing both general practitioners and general practitioner trainees *(tables 2 & 3).*

Table 2: Correct and misinterpreted abnormal signs; correct & incorrect diagnoses: Health Visitors responses (n=27)

		N	Range	Mean
Correct Signs	Pre video	27	3- 30	20.78
	Post video	27	11-40	25.44
Misinterpreted signs	Pre video	26	0 - 9	2.42
	Post video	27	0 - 6	1.29
Correct Diagnoses	Pre video	26	4 - 7	5.57
	Post video	27	1 - 7	5.15
Incorrect Diagnoses	Pre video	25	0 - 3	1.28
	Post video	26	0 - 3	1.46

Table 3: Correct and misinterpreted abnormal signs; correct & incorrect diagnoses: General Practioners and General Practioner Trainees responses (n=29)

		N	Range	Mean
Correct Signs	Pre video	29	12-32	21.51
	Post video	29	10-57	25.79
Misinterpreted signs	Pre video	24	0-10	3.17
	Post video	24	0-12	4.45
Correct Diagnoses	Pre video	29	2 - 7	5.20
	Post video	29	2 - 6	3.65
Incorrect Diagnoses	Pre video	28	0 - 4	1.32
	Post video	26	1 - 4	1.96

Abnormal Signs of Movement

The data were also analysed using Wilcoxon Signed Rank Test. Health visitors were considered as one group and general practitioners and general practitioner trainees as another group, to avoid an order effect (*see Method section*). Slight differences were identified in the two assessment videos by checking the number of correct and incorrect diagnoses for each baby. One normal baby in video B had a very high rate for incorrect diagnoses and one baby with cerebral palsy had a slightly higher rate for incorrect diagnoses.

Reviewing the videos again, it was apparent that the video vignettes were not as clear for these babies making it easier to misinterpret their movement. Therefore, video B was slightly more difficult to rate. Interpretation of results is therefore more straightforward when considering the group containing all health visitors and the group containing all doctors, since half of these groups observed each assessment video thus countering the effect of the difference in difficulty between the two videos. Following the training video, there were significant increases in the number of correct abnormal signs identified by both groups: health visitors (p=0.002), general practitioners and general practitioner trainees (p=0.000) *(table 4)*. General practitioners and general practitioner trainees when considered separately also show significant increases in correct abnormal signs, but the improvement in trainees was less than that of general practitioners.

Table 4: Correct Abnormal Signs Identified Pre & Post Training Video

Profession	Wilcoxon's z value	p Value
Health Visitors (n=27)	-3.106	0.002
GPs & GP Trainees (n=29)	-4.01	0.000
General Practitioners (n=14)	-3.184	0.001
GP Trainees (n=15)	-2.041	0.041

There were no significant changes in the number of misinterpreted signs identified by health visitors, general practitioners or general practitioner trainees, when analysed with the Wilcoxon Signed Rank Test. Numbers of misinterpreted signs remained very low throughout all subjects *(Tables 2 & 3)*.

Changes occurred in the language used by professionals to describe abnormal movement. Following the training video, terms used in the video which had not previously been used by subjects, were subsequently used appropriately, e.g. 'no anti gravity movement of legs' and 'inability to keep head in midline'.

Diagnoses

Analyses to detect any differences between number of correct and incorrect diagnoses pre and post training video were undertaken. This analysis should be read in the context that there were only seven babies on each assessment video. The mean correct diagnoses prior to seeing the training video was <5 for both groups, so the potential for change in score was already limited. For the health visitors, there were no statistically significant differences in the number of correct or incorrect diagnoses. In the general practitioners and general practitioner trainees group as a whole, there was a significant decrease in correct diagnoses (z=-2.151, p=0.031) and a significant increase in the incorrect diagnoses (z=-2.492, p=0.013). Doctors became more likely to over diagnose 'normal' babies as having cerebral palsy.

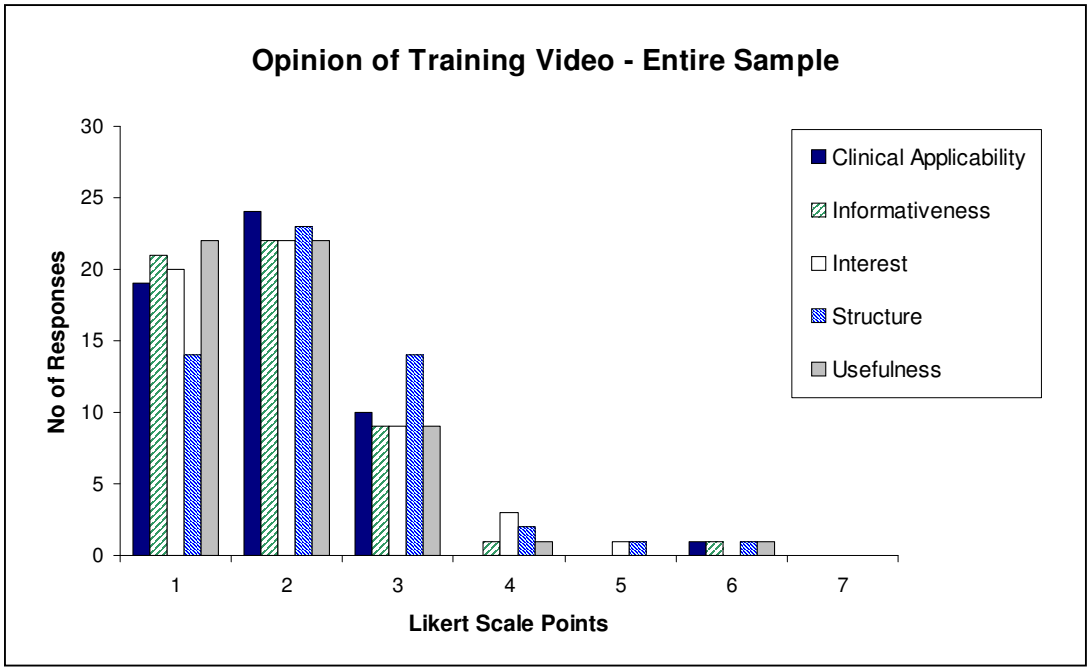
For both the entire group and the 2 individual groups, self assessed confidence scores improved significantly having viewed the training video *(Table 5).*

Table 5: Self Assessed Confidence scores pre and post training video

	GPs & GP trainees		Health Visitors	
	Pre-video	Post Video	Pre-video	Post Video
Number	29.0	29.0	26.0	24.0
Minimum	23.0	40.0	1.0	20.0
Maximum	79.0	94.0	84.0	91.0
Mean	49.2	70.9	43.2	61.0
Standard Deviation	15.7	14.9	20.9	18.1
Wilcoxon Signed Rank Test (z score)	-4.601		-3.037	
P value	0.000		0.002	

The training video was received well and highly rated by the entire group with most respondents finding the video very useful and informative *(Figure 2)*.

Figure 2: Health Professionals Opinion of Training Video



(1= strongly agree; 7= strongly disagree)

DISCUSSION

This study focussed on the ability of 29 health visitors, 14 general practitioners and 15 general practitioner trainees to identify signs of abnormal movement in babies on videotape. Having viewed the training video, significant improvement took place in all subjects' ability to identify correctly abnormal movement signs in babies. The training video appeared to be effective in assisting learning in the very short term. Learning includes understanding, and subjects demonstrated this by applying recently learned language appropriately to images on the second assessment video [26, 27]. Overall, it can be said that watching the training video improved the health care professionals' ability to detect signs of abnormal movement in the babies

in the videos. It is not possible to say whether the professionals would retain this information and be able to use it at a later date, as no later assessment of their skills took place.

General practitioners when considered separately, showed a greater increase in identifying correct abnormal signs than general practitioner trainees. This may reflect a difference in ability or that the trainees saw the slightly more difficult assessment video second.

There were no statistically significant differences in the number of correct or incorrect diagnoses for health visitors, but for doctors there was a significant decrease in correct diagnoses and significant increase in incorrect diagnoses (identifying normal babies as possibly having cerebral palsy). From this evidence, the training video did not appear to enhance diagnostic ability which is of concern. As stated previously, this finding was not unexpected as the number of babies requiring diagnosis was small, making it less likely that improvements would be detected and alertness was raised to look for cerebral palsy, possibly contributing towards the high baseline ability at identifying those babies. However, it may also confirm the view, that 'it is difficult for the attending physician, who rarely sees cerebral palsy, to make appropriate observations and interpret them correctly' [28] (p385). It might be more effective to use a training video which included other diagnostic skills such as history taking and examination in addition to movement observation. However the main aim of the study was to see if detection of abnormal movement improved, rather than overall rate of diagnosis.

If the training video were to continue to be used in the long term and raise doctors' rates of false positive diagnoses, this would have several implications. Parents would be given unnecessary anxiety about their child having a potentially serious condition. Children would be referred to a paediatrician unnecessarily, having financial implications. Children might undergo unnecessary tests and investigations to confirm or refute the diagnosis. Further research would be needed about these issues, including investigating the longer term effects of the training video and the effects of the training video on other populations of health professionals, along with more comprehensive assessment of their diagnostic skills.

Differences between professions may be explained by the following observations: health visitors' client population have a high proportion of babies for which they have a monitoring role, providing many opportunities to gain experience observing healthy normal babies. General practitioners usually see babies only when parents have already expressed concerns. There is probably a greater emphasis on examination and intervention of the possibly abnormal than observation of the potentially normal. In addition although a general practitioner would refer to a paediatrician for confirmation of diagnosis, all doctors have a great emphasis placed on diagnosis during their training. This responsibility for diagnosis may lead to issues regarding judgement and risk taking. Errors can lead to legal action, so with borderline cases there can be more likelihood of caution leading to over diagnosis [29].

Limitations of study and recommendations for future study
The sample was geographically convenient. It is therefore not possible to generalise the results to all general practitioners and health visitors. Hence in future research, it would be preferable to use a random sample. From the questionnaires it appears that General Practitioners and General Practitioner Trainees have similar training and experience. However, there may still have been differences between those groups and in future they should be considered separately.

The assessment videos were slightly different in level of difficulty. Within the health visitor group, half the subjects saw the easier video first and half saw the more difficult video first, so analysing the results of the whole group countered the effect of the different videos. The same was true of the general practitioner and trainee group as a whole. More careful assessment of such videos would be needed in any future study.

Changes in the health professionals' abilities were only considered over the very short term. It is recognised that a further assessment at a later stage would be of interest to see if longer term learning had occurred, however within the constraints of this project, this was not possible.

It is difficult to estimate the overall cost of providing training with a videotape, to large numbers of health professionals, set against the savings that may or may not be made by possible earlier identification of a small number of children with movement difficulties. It could also be argued that earlier identification might lead to greater financial outlay in services for those children. The potential benefits of earlier identification would need careful assessment. There are also the financial and emotional costs of over-diagnosing to consider, as mentioned above. More research is needed regarding these financial implications, before Primary Health Care Trusts are likely to fund such training.

In conclusion, the training video improved health professionals' ability to identify correctly signs of abnormal movement in babies. More research is needed regarding the long term effect of such training on identification and diagnosis. A further study would be of benefit to investigate whether a video including training in other aspects of the diagnostic process or other training strategies, might be equally or more effective in improving identification of possible cases of cerebral palsy. The training video was well received and could form a useful tool in training to improve professional's observation skills.

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