THE REMEDIATION OF CLUMSINESS. II: IS KINAESTHESIS THE ANSWER?

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There is a great deal of debate about how the motor performance of 'clumsy' children might be improved. In 1988, Laszlo *et al.* published a study which seemed to show that an intensive programme of kinaesthetic training worked well. Two attempts to replicate that study have recently been undertaken. In the first, Polatajko *et al.* (1995), working in Canada, compared such training (which for the sake of brevity we refer to as 'Laszlo training') with 'traditional occupational therapy' and failed to find improvement in either of their groups of subjects, even though some change in kinaesthetic sensitivity took place. However, there were a number of design differences between this study (which we refer to as 'Polatajko's') and Laszlo's which might have accounted for the Canadian group's failure to demonstrate an effect of Laszlo's programme. In our replication study (Sims *et al.* 1996), we found improvements in both kinaesthetic sensitivity and motor competence, but the untreated control group improved as much as the experimental group. These improvements may have been due to our use of the procedure of parameter estimation by sequential testing (PEST) to assess the initial level of kinaesthetic acuity, which may have had a training effect. Thus, there had not yet been a 'pure' assessment comparing Laszlo's formal training programme with a control condition in which no kinaesthetic intervention is received. Our first objective in the present study, therefore, was to re-evaluate the Laszlo procedure using for assessment only the recommended method, that of constant stimuli (described elsewhere), to identify children with a deficiency in kinaesthetic acuity.

For simplicity, we designed our first study as a comparison between a treated and an untreated group of children. We were aware, however, that if we had found that the experimental group improved on our measures of motor competence more than the untreated group did, the absence of a group to control for the 'Hawthorne effect' (that is the effects of being treated that are not specific to intervention. Roethlisberger and Dickson 1939) would still have left some uncertainty over whether Laszlo training has specific effects. Our second objective in the present experiment, therefore, was to deal with this problem by including two control groups — one untreated as before, and the other receiving an alternative intervention programme.

In selecting a method of intervention as an alternative to Laszlo's procedure of kinaesthetic sensitivity training, we considered a number of possible strategies. If our sole objective had been to control for the Hawthorne effect, we would simply

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have entertained the children in some way. Alternatively, if our objective had been to evaluate Laszlo training 'as a package', without concern for the relative merits of its constituents, we might have followed Polatajko *et al.*'s (1995) example of using another common method of intervention as a 'control' condition. However, our objective in the present study was much more specific: we wanted to devise a method of intervention which would allow us to determine whether it is the remediation of a kinaesthetic deficit that is crucial in Laszlo's approach or whether other features of the package contribute to its apparent success. We therefore needed to devise a procedure that paralleled the Laszlo approach in as many ways as possible, while at the same time removing the emphasis on kinaesthetic sensitivity. If we then found that Laszlo training was more effective than our alternative, this would seem to establish that it was the remediation of the kinaesthetic deficit that mattered.

In addition to focusing the child's attention on the 'feel' of their movements and limb positions, Laszlo training is characterised by the following principles: (1) it is intensive, with sessions held daily over a short period; (2) it uses an adaptive method of controlling task difficulty: from the beginning of training, the level of difficulty is carefully set so that each child can manage the task, and throughout each session the child perceives a gradual increase in task difficulty as a result of success at each level; and (3) frequent positive feedback is given.

On the basis of these principles, we devised a set of tasks for the children in our alternative training group. Two of these tasks were selected because they had also been used by Laszlo and her colleagues: drawing (Laszlo and Bairstow 1983) and miming (Laszlo *et al.* 1988). The third was a pursuit-rotor task, chosen because it was ideally suited to our purpose of ensuring that the children could experience progress and success. By presenting these tasks in a particular way, we could entirely avoid drawing the child's attention to the feel of their movements, and to make other sources of feedback more salient. By manipulating the difficulty of the task, or feedback where necessary, we could ensure that all children experienced 'success', whether real or apparent. In addition, we encouraged self-monitoring of daily achievements in the child. We call our alternative the 'cognitive–affective' approach.

A number of other refinements to our previous experiment were incorporated into the present study. Whereas previously we had included children who failed only one of the components of the Kinaesthetic Sensitivity Test (KST) (the qualifying test used to assess 'clumsiness'), in the present investigation only children whose scores fell below the 25th centile on both components were considered for intervention. We also increased the stringency of our selection criteria by accepting only those children whose Verbal IQs exceeded 85 and whose score on the Test of Motor Impairment (TOMI) fell below the fifth centile, rather than the 15th. Since we had established in our previous paper that there was no detectable effect of the setting from which children were selected (*i.e.* hospital clinic *versus* mainstream school), in the present study we approached both clinics and schools. Finally, since the effects we obtained in our previous study (Sims *et al.* 1966) were largely confined to a standardised test, this time we also included a teacher/parent checklist as an additional method of obtaining information on the children's response to our intervention.

Method

The design of the experiment required comparison of three groups of clumsy children, two of which received intervention and an untreated control group which did not.

Selection of subjects

Potential subjects, 77 clumsy children between the ages of 6:6 and 10:3 years, were referred from three hospital clinics which specialise in treating children with developmental disorders and from 11 mainstream schools. Medical records indicated that none had a known neurological or other medical condition that would have prevented their participation.

When these children were given the TOMI and the short form of the WISC–R,

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TABLE I
Characteristics of children in experimental groups A, B and C at pretest

	Group A (N=12)		*Group B (N=12)*		*Group B (N=12)*	
	Mean	*(SD)*	*Mean*	*(SD)*	*Mean*	*(SD)*
Age (yrs)	8.2	(0.9)	8.0	(1.0)	8.2	(1.4)
Pretest scores						
Verbal IQ (WISC–R)	109.9	(13.4)	105.9	(15.2)	104.7	(13.2)
Test of Motor Impairment	7.8	(2.1)	7.6	(2.8)	8.2	(3.1)
Kinaesthetic Sensitivity Test						
Kinaesthetic Acuity (constant-stimuli method)	17.3	(1.8)	17.3	(2.1)	15.8	(2.3)
Kinaesthetic Perception and Memory	109.6	(43.8)*	89.7	(10.6)	87.9	(15.6)

* The outlier is based on a single subject, who was eventually excluded from the analyses due to a different diagnosis.
Age ranges: Group A 7:3–9:10, Group B 6:6–9:3, Group C 6:11–10:3.

application of our more stringent selection criteria meant that we were left with 42 children. These children went on to be tested for clumsiness on both components of the KST (the kinaesthetic-acuity task and the perception-and-memory task), with the method of constant stimuli used to test the acuity component. (This method is described in the companion paper [Sims *et al.* 1996]; briefly, the child's arms rest in two runways with adjustable slopes, one of which is kept at a constant angle of 12°, and after each adjustment of the other runway the child has to judge, without looking, which arm is higher.) From this group, one child passed on both components and four other children passed on one component, leaving 37 candidates for intervention. At this point, one child's parents withdrew co-operation, making the final sample 36: 29 boys and seven girls. These children were tested on two graphic-production tasks: a handwriting task, in which the child copied the sentence 'The quick brown fox jumps over the lazy dog', and a shape-copying task, in which the child copied drawings of a square, a diamond and a triangle. Full details of all tests are provided in the companion paper (Sims *et al.* 1996).

The 36 children were allocated to groups (A, B and C) as in our previous study. Chronological age, sex, Verbal IQ, KST scores and TOMI scores were used as matching variables to produce sets of three children who were then randomly allocated to treatment and control groups. For children receiving training, neither teachers nor parents knew whether they were in group A or B (see Table I).

Both group A and group B received training over a two-week period, being seen individually for about 25 minutes per day. Group C were not given any intervention over this period. Although the intervention sessions were different in content, we ensure that the children's preparation was identical. Each child was told that they would be given activities that would help them with their movements and that they would be able to monitor their own progress each day. All children were then given charts on which progress was recorded formally at the end of each session. For both groups, tasks were presented in a counterbalanced order over the 10-day period.

TRAINING
Group A.
Children in this group received the kinaesthetic training programme prescribed by Laszlo and Bairstow (1985). All 12 children received training in both the kinaesthetic-acuity and the perception-and-memory tasks of the KST.

Group B.
Children in this group received cognitive–affective training on three tasks. The first was a manual-tracking task (pursuit-rotor task), in which the subject's objective is to keep in contact for as long as possible with a lighted target moving at variable speed around a track. In our

case, the child began the 'game' by trying to hold the point of a rod above a light moving in a circle at a speed of 5rpm. After the child had managed to maintain contact with the light for 16 out of 20 seconds on three out of five successive trials, the shape was changed, the motor was set at the same speed and further practice was given. Success at this stage was then followed by apparent gradual increases in task difficulty which were adjusted to the progress of the individual child by the experimenter. Task difficulty was adjusted by manipulating three variables: target shape, target speed and sampling frequency. Three sorts of feedback were available to the child: accurate tracking triggered a bleeping noise, scores were displayed on a monitor after each sampling period and the experimenter offered intermittent verbal feedback throughout. All children were led to believe that they were making progress daily whether or not they actually were doing so. This was achieved by the experimenter manipulating task difficulty and feedback simultaneously. For example, one strategy used successfully by the experimenter was to increase the sampling time without the child being aware of it and simply telling the child of any increase in total time on target from one trial to the next.

The second task was a drawing task. Each child was given a booklet containing pictures of increasing complexity and told that everyone would begin copying the easiest and work through the book until they had tried the hardest. The speed at which the children moved from picture to picture was determined by the experimenter, who ensured that regular and positive feedback was given to every child, irrespective of actual performance.

The third task was a miming task. Children first wrote down what they were going to mime. The experimenter then observed the mime and tried to guess what the child intended. There were large individual differences in the children's enthusiasm for this task. While some were shy and reluctant to take part, others arrived at each session with a mime planned. Whatever the outcome, however, the experimenter praised the children for their efforts in the same way as she had done for the other two tasks and indicated quite clearly that she thought the children were getting better each day.

After groups A and B had completed their intervention sessions, all three groups were reassessed on the TOMI by a tester blind to the group assignment of each child. They also completed the shape-copying and handwriting tasks again. At this point, the data from two subjects had to be excluded from further analysis. One subject from group A was excluded because he showed serious behavioural problems during the training and assessment sessions. His parents and occupational therapist were also concerned about his dangerous and erratic behaviour, and after the end of the study he was diagnosed as autistic. A child from group C was excluded because at post-testing his mother told us that he had been practising the TOMI tasks at home! The shape-copying and handwriting tasks were judged by blind raters, who were asked to state a preference, whenever possible, between the pretest and posttest samples of each child.

In order to get some idea of how the 'treated' children were performing outside the experimental setting, teachers (or parents for the clinically referred subjects) were asked to complete a checklist on the progress of the children in groups A and B. This checklist involved seven areas of performance: five concerned with movement competence, and two more general areas, concerned with social behaviour and school achievement. For each area, the adult was requested to note whether she thought the child had improved, got worse or stayed the same as a result of the intervention received.

A follow-up investigation was carried out four months after the beginning of the training programme. Copying and handwriting samples were collected and teachers or parents were asked to complete another checklist to see whether the child had made any further improvements.

Results

PRETEST SCORES - ADEQUACY OF MATCHING

The means and standard deviations of the children's scores on the matching variables are given in Table I. One-way analyses of variance on the children's scores for kinaesthetic acuity, kinaes-

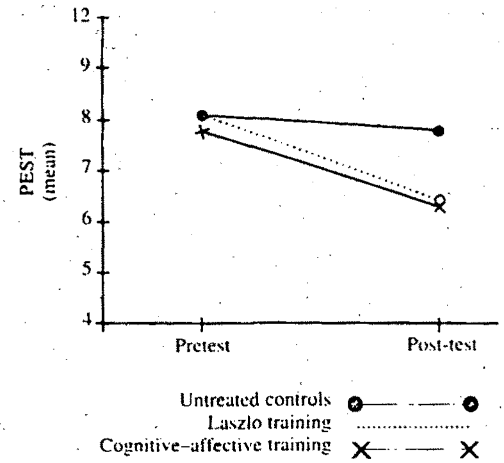

Fig. 1. TOMI scores for three groups of subjects at pre- and post-test. Lowered score denotes improvement.

thetic perception and memory, the TOMI and Verbal IQ confirmed that the groups were well matched (kinaesthetic acuity, F=2.3; kinaesthetic perception and memory, F=2.17; TOMI, F=0.10, Verbal IQ: F=0.34, all *ns*, df=2,34 in all cases). There were also no differences between the children recruited from schools and those recruited from clinics.

Effect of intervention - comparison of three groups

The movement competence of the children in Group C, who received no intervention, did not change during the period of the experiment as measured by the TOMI (z=1.13, NS) (Fig. 1). By contrast, the scores of both groups A and B improved significantly (Wilcoxon's matched-pairs test for group A, z=2.8, p<0.005 and for group 2, z=2.43; p<0.02, one-tailed). As in our previous experiment (Sims *et al.* 1996), the main area in which improvement took place was in the balance tasks of the TOMI (z=2.6, p<0.05 and 2.4, p<0.05 respectively for groups A and B). Improvements in neither the manual dexterity nor ball-skill reached significance. Further, a Mann–Whitney U test failed to show a significant difference between the two groups (A and B) in the amount of improvement they had made (U=64.5, *ns*).

For both shape-copying and handwriting, the various judges did not show any overall preference between pretest and post-test samples (Mann–Whitney, all NS). Moreover, on the handwriting task, children were just as often rated 'worse' after intervention as 'better'. In contrast, the number of sample pairs given ratings of 'no difference' did differentiate the groups. For the shape-copying test, more 'no difference' judgements were awarded to group C than for either A (U=21.0, p<0.05) or B (U=24.0, p<0.05), and this pattern of results also occurred for the handwriting task (U=26.5 and U=33, p<0.05, for groups A and B respectively).

Validation of the findings - teachers' and parents' views and follow-up measures

Only seven of the adults involved with the children in group A and seven from group B returned both checklists in which they were asked to note the changes observed for the first time at post-test. One checklist was given immediately after the initial training programme (for group A this training was kinaesthetic and for group B it was cognitive–affective) and the second was given at follow-up, 12 weeks after completion of the first checklist. While the data loss at this point is unfortunate, the information provided by the co-operating adults does seem to support our objective findings. As Table II shows, at post-test, of the seven children in each group, the mean numbers of children who were judged to have improved on the various categories were 2.7 in group A and 2.3 in group B. Only one child was judged by a parent to have got worse, and this judgement applied only to the two categories which were not specific to motor activity — social behaviour and general achievement. However, this negativity had disappeared by follow-up. Also, at follow-up, 'better' judgements had risen overall to a mean of 4.7 in children of group A and 4.4 in children of group B). By this stage, 'better' judgements for group A exceeded 'same' judgements in all categories except drawing or painting. The only significant difference between groups was for general achievement, where group A had more 'better' judgements than group B at both

TABLE II
Children's checklist scores at post-test and follow-up, relative to scores prior to training

	In Group A (Laszlo training) (N=7)			*In Group B (cognitive–affective intervention) (N=7)*		
	Worse	*Same*	*Better*	*Worse*	*Same*	*Better*
Post-test						
Motor Skills						
Drawing/painting	0	7	0	0	6	1
Handwriting	0	3	4	0	4	3
Manual activities	0	3	4	0	3	4
Dressing	0	6	1	0	6	1
Ball skills	0	5	2	0	3	4
Social Behaviour	0	4	3	1	4	2
General Achievement	0	2	5	1	5	1
Mean	0	4.3	2.7	0.3	4.4	2.3
Follow-up						
Motor Skills						
Drawing/painting	0	4	3	0	1	6
Handwriting	0	1	6	0	0	7
Manual activities	0	1	6	0	3	4
Dressing	0	3	4	0	5	2
Ball skills	0	3	4	0	3	4
Social Behaviour	0	3	4	0	3	4
General Achievement	0	1	6	0	3	4
Mean	0	2.3	4.7	0	2.6	4.4

Values are numbers of children

post-test and follow-up. Handwriting was the category in which most children were judged to have made progress.

As an additional measure at follow-up, we collected further handwriting and shape-copying samples from these same 14 subjects. One child in group A could not be present to give a follow-up shape-copying sample. Using six new judges, we compared pretest with follow-up samples. Taking first the total preference judgements over raters for each subject's shape copying revealed that 5 subjects received more pretest preference judgements and 7 more follow-up preference judgements, with one subject showing no difference. For handwriting, 5 subjects received more pretest preferences and 5 more follow-up preferences, with the remainder showing no difference. There were no significant differences between groups A and B on either task.

Does cognitive–affective training affect kinaesthetic sensitivity?

So far, we have shown that groups A and B improved equally regardless of the type of intervention they received. An obvious question, therefore, is whether cognitive–affective training had influenced group B's kinaesthetic performance in any way. To investigate this possibility, group B were given the kinaesthetic training programme the week after the completion of the cognitive–affective programme. As an approximate measure of whether cognitive-affective training had any immediate effect on group B's kinaesthetic sensitivity, we simply recorded the first (the largest) angle of separation at which the child made an incorrect judgement during their first training session and compared this value for the equivalent value found for Group A children at the beginning of their kinaesthetic training. There were no differences on this measure, thus providing no evidence that group B's training had affected their level of kinaesthetic skill.

Another possibility we considered was that cognitive–affective training might have provided the child with a better

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strategy for addressing the task, which would reveal itself in speed of learning. During the training, children had at least five trials at each angle of separation and continued at that level until the criterion of four correct out of five trials was reached. When the child achieved 4 out of 5 correct, they progressed to the next angle of separation (2° smaller). For the purposes of this comparison, we deemed a child to have 'failed' at a level if they had more than one error during the first five trials. As a measure of speed of 'training', we took the difference between the angle at which each child made their first incorrect judgement and the angle at which they first failed. On this measure, group B showed a bigger difference (faster training) than group A ($N=22$, $U=31.5$, $p<0.06$), a difference which fell just short of significance.

As a final measure of responsiveness to kinaesthetic training, we examined the total number of days (out of 10) each child took to reach perfect performance at 5° separation. A score of 11 was given to subjects who failed to complete the training within this period. Group B reached this point slightly faster on average than group A (means: group A, 6.5 days; group B, 5.4 days; $N=22$, $U=36$, $p=0.09$). We could find no difference between the groups in the way they responded to the perception-and-memory task. These data demonstrate that while cognitive–affective training does not improve performance on the kinaesthetic task, it seems to have a marginal effect on responsiveness to kinaesthetic training.

Discussion

It was once common for paediatricians to assume that the prognosis for children identified in the early years as having movement problems was fairly benign. This encouraged a relaxed attitude, in which inaction rather than intervention could be presented as the considered view. With the accumulation of evidence that movement difficulties not only tended to persist but also became associated with a broader range of developmental problems, this position became untenable and the need to evaluate the available therapeutic techniques became pressing. Against this background, the remarkable claim by Laszlo *et al.* (1988) that improvement can be achieved in 75% of clumsy children with a briefly administered, narrowly focused and theoretically grounded remedial programme demanded independent evaluation.

In the present experiment, three matched groups of clumsy children were compared, two of which received 10 days of intervention while the third continued with their normal school activities. TOMI scores showed that both groups receiving intervention improved significantly, and this set them apart from the untreated group who did not. However, the group given Laszlo training did not improve any more than the group given cognitive–affective training. Four months later, further gains were recorded and there were no reports of deterioration in either motor skills or general attainment.

We first discuss these findings in relation to previously unresolved issues, and then consider what alternative, potentially active components might characterise the conditions found to be remedially effective.

The results of our first experiment had suggested that the use of the PEST procedure as a method of obtaining pretest kinaesthetic-acuity scores might actually have served as a training method. In this study, we reverted to the method of constant stimuli for KST screening and found that the performance of the untreated control group remained unchanged on both the TOMI and graphic-production tasks. Therefore, we are confident that the experimental children, who are not capable of making disciminations at pretest on the KST, later improved their motor competence after Laszlo or cognitive–affective training as a result of the intervention.

Next, any previous suspicions concerning the possibility that improvements on the TOMI are a spurious result of repeated testing can be discarded, since our untreated control group showed no effect of practice on the test. This finding is also consistent with the lack of improvements on retest with TOMI shown by any of the groups in the Polatajko study. Furthermore, we did not rely on the TOMI alone for evidence of improvement, since the effectiveness of the two types of intervention was confirmed through the very different medium of the parent/teacher checklist.

The findings from the graphic-production tasks were much less easy to interpret. In the companion study (Sims *et al.* 1996), our findings were consistent with those of Laszlo and colleagues, who noted that some time had to pass after training before improvements in handwriting took place. However, in the present experiment, whereas the untrained group showed no change at all, the samples of the trained children, gathered before and after intervention, were seen as differing, but were just as often rated 'worse' after intervention as 'better'! We were reminded at this point of Schoemaker and colleagues' (1994) interesting proposal that some children trade accuracy for speed immediately after intervention and thereby initially produce work that looks worse. However, since we had no measure of speed of performance, we cannot comment further.

We now turn our attention to the question of which particular components of our interventions produced the observed changes in motor performance. The first point to make, however, is that the improvements we have to account for, although real, were not great in either group of 'treated' children, any more than they were for the children assessed on the TOMI in our previous study or those in the original report of Laszlo *et al.* (1988). Of the children receiving Laszlo training at some point in our studies, for example, two-thirds still deviated from the 'normal' expected TOMI score at the end of the study. Also, our alternative treatment, which was designed to avoid emphasis on kinaesthetic input, did not affect group B's level of kinaesthetic ability. In other words, to the extent that our alternative approach equalled the effect of Laszlo training, the common factor mediating between the training and performance must have been something other than kinaesthetic skill.

In our attempt to disentangle the peculiarly kinaesthetic content of Laszlo training from other elements which might have had a positive effect, we began by considering how training was distributed over time. In our study, both the group given cognitive–affective training and the Laszlo group received intensive input over a 10-day period. In contrast, it seems that in neither the study of Laszlo *et al.* (1988) nor that of Polatajko *et al.* (1995) were the groups adequately matched for this feature. In Laszlo's case, it would seem that the children in the 'spatial and temporal programming' group who failed to improve on the TOMI were actually being trained on six different tasks, as opposed to the two contained in the kinaesthetic programme. This evidence, taken together with the deviation of Polatajko and colleagues from Laszlo's day-by-day programme in order to follow the more usual practice of seeing children 2 to 3 times a week, raised the possibility that concentration on individual tests is an important factor. However, since Schoemaker *et al.* (1994) did succeed in obtaining improvement using a conventional therapy with similar dilution, concentration alone seems unlikely to be critical.

Over and above its concentration and its kinaesthetic focus, there appear to be four potentially crucial aspects of Laszlo's training technique: (i) the simplicity of the tasks brings them comfortably within the capability of most children, from the start, readily engaging interest and enthusiasm; (ii) increments in the level of difficulty and the criteria for progressing are set so as to give the child a sense of progress and encourage perseverance; (iii) feedback is always positive; (iv) active involvement is required by having the child engage in regular self-assessment. These are the ingredients we tried to incorporate into our cognitive–affective programme, even though the positive feedback had to be faked in some cases. From our observations, we feel that the various procedures exert such a strong effect on the child's motivation that motor learning is facilitated. In other words, believing that they are gaining mastery of a particular skill and the accompanying increase in feelings of self-competence seem to be fundamental in motivating the child to approach a task in a way that improves their actual performance.

If our analysis so far is correct, then aspects of presentation may be even more important than the content of a programme. In addition to the factors just mentioned, the remarkable effectiveness of the PEST procedure in producing unlooked-for improvements suggests that dynamic motor content, in itself, may not be strictly necessary as an aspect of remedial programmes! Since neither Laszlo's study nor Polatajko's provided sufficient detail on either the motor or 'cognitive–affective' content of their control treatments, it is fruitless to speculate as to why these were ineffective. In contrast, Schoemaker *et al.* (1994), who did obtain improvements using a traditional package, made an admirable attempt at describing its non-motor aspects. However, even this does not allow detailed appraisal of the sort of factors just reviewed. An important next step on these issues, therefore, is the experimental manipulation of content and presentation independently.

Finally, we remind the reader of the distinction between theoretical and practical implications. While nothing in the results of our studies offers any support of the opinion that kinaesthetic 'blindness' plays the unique causal role, the moderate amelioration that we were able to achieve carries us some way forward in the pragmatic design of effective, speedy interventions that do not require profligate use of resources.

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SUMMARY
The remediation of clumsiness - II: Is kinaesthesis the answer?
The paper reports the second of two studies designed to evaluate the effectiveness of the Kinaesthetic Training Programme (Laszlo and Bairstow, 1985) for children with movement difficulties. Three groups of 12 children were matched on age, IQ and sex as well as degree of kinaesthetic and motor impairment. One group received the Laszlo training, another received a training programme designed to avoid explicit reference to kinaesthesis and the third group received no training. Children receiving no intervention failed to show a change in performance. By contrast, the motor competence of both groups of treated children improved significantly. There was no advantage for the Laszlo trained group. It seems that in designing a remediation programme for clumsy children, the way that training is presented is as important as its actual content.

RÉSUMÉ
La correction de la maladresse. II: La réponse est-elle dans la kinesthésie?
L'article rapporte la seconde de deux études établies pour évaluer l'efficacité du Programme d'entraînement kinesthésique (Laszlo et Bairstow, 1985) pour enfants ayant des difficultés motrices. Trois groupes de 12 enfants ont été appariés pour l'âge, le Q.I. et le sexe, ainsi que pour le degré d'atteinte motrice et kinesthésique. Un groupe bénéficia de l'apprentissage Laszlo, un autre bénéficia d'un programme établi pour éviter les références à la kinesthésie et le troisième groupe ne bénéficia d'aucun programme. Il n'y eut aucun changement des performances dans ce dernier groupe, sans entraînement. A l'opposé, les compétences motrices des deux groupes d'enfants traités furent améliorées significativement. Aucun avantage ne fut noté pour le groupe Lazslo. Il semble qu'en établissant une rééducation pour enfants maladroits, la façon dont le programme est présenté soit aussi importante que le contenu.

ZUSAMMENFASSUNG
Behandlung der Unbeholfenheit. II: Ist Kinaesthesie die Antwort?
Diese Arbeit berichtet über die zweite von zwei Untersuchungen, die zur Beurteilung der

Wirksamkeit des kinaesthetischen Trainingsprogramms (Laszlo and Bairstow, 1985) für Kinder mit Bewegungsstörungen durchgeführt wurde. Es wurden drei Gruppen von 12 Kindern mit vergleichbarem Alter, IQ und Geschlecht, sowie Grad der kinaesthetischen und motorischen Störung zusammengestellt. Eine Gruppe erhielt das Training nach Laszlo, eine andere bekam ein zusammengestelltes Trainingsprogramm, um eine weitere Referenz zu vermeiden und die dritte Gruppe wurde nicht behandelt. Die Kinder ohne Behandlung zeigten keine Veränderung ihrer Leistungen. Im Gegensatz dazu besserten sich die motorischen Fähigkeiten der Kinder in beiden Trainingsgruppen signifikant. Die nach Laszlo trainierte Gruppe war nicht besser: Offenbar ist für das Konzept eines Behandlungsprogramms die Art, wie ein Training gemacht wird, genauso wichtig wie sein eigentlicher Inhalt.

RESUMEN

La mejoría de la torpeza. II: Es la cinestesia la respuesta?

La comunicación aporta el segundo de dos estudios realizados para evaluar la eficacia del Programa de Entrenamiento Cinestésico de Laszlo (Laszlo y Bairstow, 1985) para niños con dificultades de movimiento. Se hicieron tres grupos de niños comparables por la edad, CI, sexo y grado de alteración cinestésica y motora. Un grupo siguió el método de Laszlo, otro un programa de entrenamiento designado para evitar toda referencia esplícita a la cinestesia y un tercer grupo no siguió ningún entrenamiento. Los niños sin intervención no mostraron ningún cambio en la realización. En contraste, ambos grupos que siguieron un tratamiento mejoraron significativamente. No hubo ninguna ventaja para el grupo de Laszlo. Parece que al planificar un programa de mejora para niños torpes, la manera como es presentado el entrenamiento, es tan importante como su contenido real.

References

Laszlo JI, Bairstow PJ. (1983) Kinaesthesis: its measurement, training and relationship with motor control. *Quarterly Journal of Experimental Psychology* **35:** 411–21.

— (1985) Test of Kinaesthetic Sensitivity. London: Holt, Rinehart and Winston.

— — Bartrip J, Rolfe UT. (1988) Clumsiness or perceptuo-motor dysfunction. In: Colley AM, Beech JR, editors. Cognition and Action in Skilled *Behaviour. Advances in Psychology No. 55.* North-Holland: Elsevier Science Publishers. p 293–309.

Polatajko HJ, Macnab JJ, Anstett B, Malloy-Miller T, Murphy K, Noh S. (1995) A clinical trial of the process-oriented treatment approach for children with developmental co-ordination disorder. *Developmental Medicine and Child Neurology* **37:** 310–9.

Roethlisberger, FJ, Dickson WJ. (1939) *Management and the Worker.* Cambridge, MA:Harvard University.

Schoemaker MM, Hijlkema MGJ, Kalverboer AF. (1994) Physiotherapy for clumsy children: an evaluation study. *Developmental Medicine and Child Neurology* **36:** 143–55.

Sims K, Henderson SE, Hulme C, Morton J. (1996) The remediation of clumsiness. I: An evaluation of Laszlo's kinaesthetic approach. *Developmental Medicine and Child Neurology* **38:** 976-987.