A meta-analysis of studies into the effect of acupuncture on addiction

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SUMMARY. A literature search revealed 22 controlled clinical studies on the efficacy of acupuncture in three fields of addiction: cigarette smoking (15), heroin (five), and alcohol (two). These studies were reviewed using a list of 18 predefined criteria of good methodology. A maximum of 100 points for study design could be earned, divided over four categories: comparability of prognosis; adequate intervention; adequate effect measurement; and good data presentation. The study design was generally poor. No study earned more than 75 points and 12 studies (55%) earned less than 50 points. For smoking cessation, the number of studies with negative outcomes exceeded by far the number with positive outcomes. Taking the quality of the studies into account this negative picture becomes even stronger. For heroin and alcohol addiction controlled clinical research is both scarce and of low quality. Claims that acupuncture is efficacious as a therapy for these addictions are thus not supported by results from sound clinical research.

Introduction

IN the early 1970s a number of enthusiastic reports were published about the effectiveness of acupuncture in combatting addiction to heroin, alcohol, and cigarette smoking. Speculation centred on the hypothesis that endogenous opiates were released by acupuncture and these mimicked the effect of exogenous opiates, such as heroin in pain relief. Endogenous opiates could also block the mechanism involved in addiction to drugs. However, many of the clinical studies lacked reference groups. Controlled clinical research on acupuncture and addiction is scarce, although the results of a controlled clinical trial on addiction to alcohol have recently been published.[1]

In this review of published studies we use the technique of meta-analysis† based on predefined criteria of good methodology to examine whether compelling evidence from clinical research exists that acupuncture is efficacious in cigarette smoking, heroin or alcohol addiction.

Method

A MEDLINE on-line literature search was made for the years 1963–88, using the following keywords: acupuncture, clinical trials, therapy, tobacco, smoking. This was combined with MEDLINE CD-ROM searches of the year 1989, searching *Excerpta Medica* for the years 1981–89 using the keyword acupuncture, and correspondence with and visits to experts on acupuncture. 'Grey' literature was screened with the help of a title service bulletin of the National Centre for Information and Documentation on Alternative Medicine in the Netherlands. Efforts were also made to translate papers from the USSR, but the quality of the methodology appeared to be disappointingly low. Papers in Russian were therefore excluded unless the words 'randomized' or 'blind' were mentioned in the English abstract but this was never found to be the case. Screening some of the recent Chinese literature available in English (*Journal of Traditional Chinese Medicine*) revealed case series but no controlled trials.

Studies were included in this review if they met the following conditions: human subjects addicted to either cigarette smoking, heroin, or alcohol were studied; a reference group was used; needles, press needles, or staples were used in the acupuncture treatment (studies in which only surface electrodes or laser acupuncture were used were excluded); needles were used in studies of electroacupuncture. The last two criteria emphasize the authors' pragmatic definition of acupuncture as a technique involving insertion of needles.

A total of 27 studies were identified. Of these, four were excluded[2-5] because they did not involve insertion of needles, and one because it was published twice.[6] This left 21 published papers for further analysis and one unpublished (Tschopp

Table 1. List of criteria used to assess the methodology of studies of acupuncture (maximum score 100).

Criteria	Score
Comparability of prognosis	
A Homogeneity of sample[a]	3
B Prestratification of sample[b]	3
C Randomization to control and treatment groups	12
D Comparability of relevant baseline characteristics shown	2
E At least 50 patients per group	10
F No more than 20% loss to follow-up	5
Adequate intervention	
G Diffuse noxious inhibitory control avoided[c]	2
H Acupuncture procedure adequately described[d]	10
I Good quality of acupuncturist mentioned	15
J Existing treatment modality in reference group[e]	3
Adequate effect measurement	
K Patients blinded	10
L Evaluator blinded	5
M Follow-up after treatment for at least 6 months[f]	5
N Biochemical validation of self reported outcome	8 (4)[g]
O Symptoms of withdrawal noted	0 (2)[g]
P Changes in occupational, social, psychological status or criminal behaviour noted	0 (2)[g]
Q Side effects remarked on	2
Data presentation	
R Reader able to do inferential statistics	5

[a]This criterion was scored with great caution because it involves much knowledge about which factors are prognostically relevant and opinions in this respect vary widely. [b]This was always scored if authors mentioned it, irrespective of prognostic relevance. [c]Diffuse noxious inhibitory control refers to the phenomenon of extra-segmental counter-irritation that could cause sham acupuncture procedures (not at acupuncture points) to be active placebos.[27,28] [d]This was scored only if the acupuncture points used, the number of minutes per treatment, treatment interval and total treatment duration were mentioned. [e]Before a new treatment is implemented its efficacy must be compared both with placebo and other existing treatments. [f]Defined as the time period from the last treatment to the last effect measurement. [g]Numbers in parentheses show scores for studies on heroin and alcohol.

† Meta: of a higher or second order kind.

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JM).[1,7-26] Each paper was scored using a list of 18 predefined criteria which covered four areas of methodology (Table 1). The maximum possible score was 100. The numbers on Table 1 refer to points that were awarded if the criterion was met; half of the maximum score (rounded up) was awarded if the reviewer agreed that the report was unclear on this criterion. These criteria were drawn up largely on the basis of well-accepted principles of intervention research.[29,30] More points were given to criteria which were considered more important. Two of the authors (GtR and JK) scored the publications independently.

To determine the outcome of the studies (positive, negative, uncertain) abstracts and discussion sections of original articles were screened (in that order) for statements such as 'x is more efficacious than y' or 'x is (not) significantly more effective than y'.

Results

At no time did inconsistencies between the reviewers in assigning the scores exceed 7 points (out of a total of 100) and these were usually due to reading errors of one of the reviewers, which could be corrected.

Table 2 shows the results of the analysis of the methodology of the studies, together with the stated outcome of the studies. Reading the table horizontally one gets a clear picture of the methodological quality of individual publications. Vertical reading gives an impression of the shortcomings of controlled clinical research on acupuncture and addiction. Striking features in the publications on smoking were the inadequate numbers of patients (criterion E), and the virtual lack of biochemical validation of self-reported outcome (criterion N). In the publications on heroin no randomization (criterion C) and no sham acupuncture (criterion K) were used, while patient numbers were small (criterion E). Only two studies on acupuncture for alcohol addiction were found, both of moderate quality.

Figure 1 shows the relationship between study outcomes (according to what the authors stated in their abstract and/or discussion) and methodological quality for 21 studies. It shows that studies with negative outcomes had higher scores on quality of methodology. Only one of eight positive studies (13%) scored 50 points or more, whereas nine of 13 negative studies (69%) scored in this range. One study[23] was excluded from Figure 1 because no conclusion was drawn by the investigators.

Three out of five studies on heroin reported positive results. However, all the studies are of low methodological quality, and no reference group receiving sham acupuncture was used. The positive results of the studies on alcohol[1,26] (both by the same investigators) should be interpreted with caution. These studies suffered from very high dropout rates of 70 and 39%, respectively. High dropout rates are notorious for their potential to bias results from clinical trials. Furthermore, no biochemical validation of self reported outcome was obtained, and the numbers of participants were small (Table 2).

Discussion

The results of this meta-analysis show that most investigators underestimate the intricacies of research into the efficacy of acupuncture in addiction. Severe shortcomings in the methodology of the studies are revealed by systematic scoring using our list of criteria. Imbalances in prognostic factors (at baseline) between the index and reference groups might explain

Table 2. Scores on methodology for all studies (see Table 1 for definitions of criteria A–R).

		Scores on methodological criteria																		
Author and reference	Outcome	A (max 3)	B (max 3)	C (max 12)	D (max 2)	E (max 10)	F (max 5)	G (max 2)	H (max 10)	I (max 15)	J (max 3)	K (max 10)	L (max 5)	M (max 5)	N (max 8(4))	O (max 0(2))	P (max 0(2))	Q (max 2(2))	R (max 5)	Total score (max 100)
Smoking studies																				
Gilbey[7]	Neg	–	–	12	2	–	5	–	10	15	–	10	5	–	–	–	–	–	–	59
Parker[8]	Neg	–	–	12	–	–	5	–	–	–	–	10	–	–	–	–	–	2	5	34
Lacroix[9]	Pos	–	–	12	–	–	–	–	–	–	–	5	–	–	–	–	–	–	5	22
MacHovec[10]	Pos	–	–	–	–	–	–	–	–	15	3	10	5	5	–	–	–	–	5	43
Lagrue[11]	Neg	–	–	12	–	–	–	–	10	–	–	10	3	–	–	–	–	–	5	40
Lamontagne[12]	Neg	–	–	12	2	–	5	–	–	15	3	–	3	5	–	–	–	–	5	50
Martin[13]	Neg	–	–	12	–	–	–	2	10	–	–	10	5	–	–	–	–	2	–	41
Steiner[14]	Neg	–	–	12	–	–	–	–	10	15	–	10	3	–	–	–	–	2	–	52
Labadie[15]	Neg	–	–	6	–	10	5	–	10	15	3	–	5	5	–	–	–	2	5	66
Cottraux[16]	Neg	–	3	12	2	10	5	–	10	15	3	–	3	5	–	–	–	2	5	75
Gillams[17]	Neg	–	3	12	2	–	5	–	10	–	3	10	–	5	–	–	–	2	5	57
Hackett[18]	Pos	–	–	–	–	–	–	–	–	–	3	–	–	5	8	–	–	2	5	23
Clavel[19]	Neg	–	3	12	2	–	5	–	10	–	3	–	–	5	8	–	–	–	5	53
Tschopp[a]	Neg	–	3	12	–	–	5	–	10	15	3	–	5	5	8	–	–	–	5	71
Vandevenne[20]	Neg	–	–	12	2	10	5	–	10	15	–	10	–	5	–	–	–	–	5	74
Heroin studies																				
Wen[21]	Pos	–	–	–	–	–	5	–	10	–	3	–	–	5	4	–	–	–	5	32
Man[22]	Neg	–	–	–	–	–	–	–	10	15	3	–	5	–	4	2	–	–	–	39
Newmeyer[23]	?	–	–	–	2	10	–	–	–	–	3	–	–	5	2	2	2	2	–	28
Geerlings[24]	Pos	–	–	–	2	–	5	–	10	–	3	–	–	–	4	2	–	–	5	31
Geijer[25]	Pos	–	–	–	2	–	–	–	10	15	2	–	–	–	4	2	–	–	–	35
Alcohol studies																				
Bullock[26]	Pos	–	–	12	1	–	–	1	10	15	–	10	–	–	–	2	–	–	5	56
Bullock[1]	Pos	–	–	–	2	–	–	–	10	15	–	5	3	5	–	–	2	–	5	47

[a]Unpublished paper: Tschopp JM. Comparison de deux méthodes de sevrage tabagique: acupuncture versus chewing gum à la nicotine. Genève, 1985 (can be obtained from the authors).

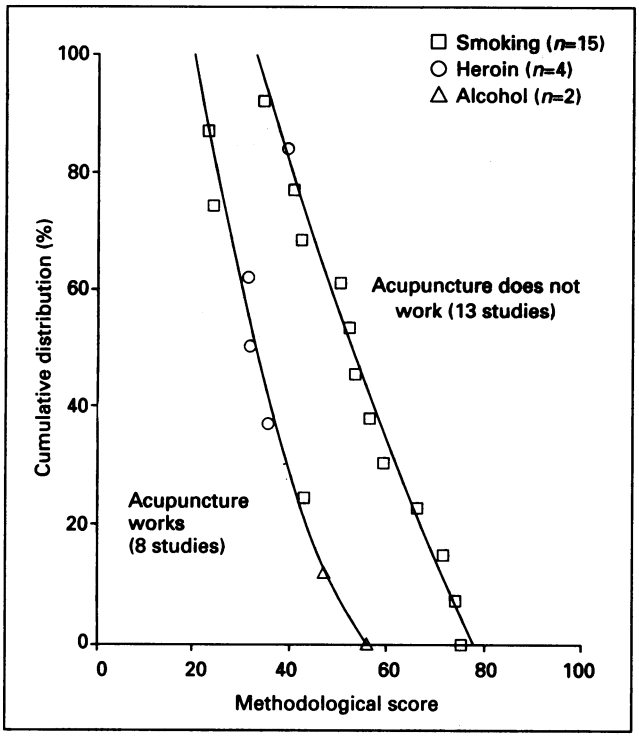

Figure 1. *Cumulative distribution of scores for 21 studies (excluding reference 23).*

the outcome of a trial. In future research, more attention should be paid to prognostic comparability between index and reference groups. This means optimum measurement of prognostic factors such as motivation, drug dependence, addiction history, and addiction behaviour of partners. Motivation could be operationalized in terms of concern about one's own addiction, pressure from partners to change or not to change one's behaviour, number of attempts to change in the past, and perhaps suffering from addiction related disease. Prestratification of the sample to allow for the most important of these factors can be useful. Future investigators will not necessarily have to invent their own measuring indices. For instance, Tønnesen and colleagues used the Horn-Russell scale to measure dependency.[31] It is also desirable that investigators pay attention to non-intended effects of withdrawal. For example, smoking cessation has been reported to cause weight gain[14,32] and irritability.[32]

Although we have found more controlled clinical trials into the effect of acupuncture on addiction to tobacco than have the authors of earlier and more informal reviews,[33,34] our conclusions are very similar. Basically, there is no evidence that acupuncture is efficacious in the treatment of addiction to smoking. Unfortunately, other interventions do not seem to be very efficacious either.[35]

In 1978 Whitehead wrote a review of studies into acupuncture and addiction to heroin.[36] Although he only reviewed three uncontrolled trials, whereas we found five controlled trials, his conclusion still seems valid in 1990: 'The studies that have served as the basis of much of what has been said and written about the use of acupuncture in the management of addictions ... fall seriously short of adequate clinical trials. The utility of acupuncture remains unproven'.[36]

Future investigators into acupuncture and alcohol addiction should try to avoid high dropout rates. A key point is to focus on the reasons why participants drop out. Balance of dropout rates between index and reference groups is in itself an insufficient guarantee against biased results. Apart from enthusiastic personnel, and minimally cumbersome interventions, exclusion of those alcoholics very likely to drop out could be a useful way to limit loss to follow-up.

Criteria-based meta-analysis is a method in which the reviewer is 'panning for gold'.[37] This is a superior method to the pooling of results from different studies which is becoming a fashionable way to review the evidence from the literature. It is very unhelpful to combine data from good research with data from bad research, and, in addition, there are no clear criteria to decide when pooling is desirable. Owing to differences in patient selection and type of acupuncture treatments, even pooling the results of trials on smoking addiction alone would make the results hard to interpret. It might be thought that a major drawback of the criteria-based approach is that one major mistake in the method of an otherwise good study could lead to a study being discounted. However, a study with one decisive flaw in design or execution can still obtain a reasonable score. In hindsight, we would have preferred to exclude retrospective studies[24] and trials with dropout rates over, say 25%.[1,22,26] However, knowledge of study outcome does not allow predefined criteria to be changed.

We were not blinded to the outcomes of the studies in our review. This means that some degree of reviewer bias cannot be excluded. However, any reader is able to check our point assignment and to apply different weights to different criteria.

As with any review of the literature, editors' decisions about the suitability of studies for publication might be a source of bias. It is hard to estimate the magnitude of publication bias, especially because here a controversial alternative therapy is involved and it is possible that even positive trials are being excluded from publication. However, our analysis shows that, especially in the area of smoking addiction, fairly large numbers of positive results from well designed studies would be needed to change this bleak picture.

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