RESEARCH ARTICLE

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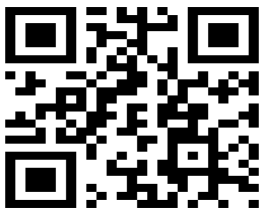
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Relationship between experience, knowledge, and expectations: A prospective study in 85 acupuncture patients

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ABSTRACT
Despite extensive research, the mechanism(s) by which acupuncture works remain unclear. Evidence points towards psychological and social mechanisms of acupuncture, but few studies have looked at the factors that may influence those mechanisms. We performed an original study of the relationship between experience, knowledge, and expectations in acupuncture patients. We found that social factors may influence expectations for patients seeking acupuncture, but that the factors influencing a patient's experience of acupuncture cannot be easily generalized to the overall patient population. Our study may help future investigators avoid making incorrect generalizations based on circumstantial, context-specific evidence by providing a model for determining comparability within and between patient populations.

Keywords: Acupuncture, Experience, Knowledge, Expectations, Social, Mechanisms.

INTRODUCTION
Studies of the mechanism and effects of acupuncture are notoriously inconsistent[1], with conclusions varying greatly between studies. This problem is partly due to historical inconsistencies in the use and definition of the word "acupuncture,"[2] but likely also stems from the multi-faceted, ambiguous nature of acupuncture itself. Studies show that acupuncture treatments, both real and sham, generally achieve greater levels of success than controls for certain types of pain and conditions,[3-5] but efforts to elucidate the mechanism of acupuncture have resulted in many researchers "dichotomizing the effects of acupuncture into specific (acupuncture-related) and nonspecific (sham-related) components."[3] Some authors have suggested that placebo may account for most, if not all, of the observed nonspecific effects of acupuncture,[4,6,7] while others maintain that placebo is only one of many factors that influence treatment outcomes.[3,8]

Although arguments for and against acupuncture often revolve around the differences between effectiveness and efficacy in clinical and research settings,[2,9,10] how acupuncture works appears to be generally less important to patients and practitioners than whether acupuncture works.[2,11-14] Evidence points heavily to the influence of psychosocial factors in the attitudes, responses, and treatment-seeking behaviors of acupuncture patients,[6,12-18] with one study finding that "patients whose families used TCM [traditional Chinese medicine] were about three-and-a-half times more likely also to use TCM themselves (for any reason) than patients whose families did not use TCM."[17] Many authors have also suggested that knowledge and

expectations may play a major role in acupuncture treatment outcomes.[2,6,7,19-21] Although this has been contested,[20,22] the general lack of research involving the relationship between knowledge, experience, and expectations of acupuncture[23] makes it difficult to determine which of the proposed factors have merit. To this end, we have performed an investigation of the relationship between expectations, experiences, knowledge, and preferences in acupuncture.

METHODS
Following the study's approval by the institutional IRB, patients at an outpatient musculoskeletal center in New York City were asked to participate in an in-person survey at the beginning of or prior to acupuncture treatment sessions. All patients were at least 18 years old, and patients 80 years old and older were grouped into a single category to maintain anonymity. Although patients came from a number of distinct cultural and socioeconomic groups, and presented with a variety of complaints, these were not recorded to maintain anonymity.

The first part of the survey consisted of a prompt followed by the Acupuncture Expectancy Scale (AES).[16,24] The four statements of the AES (each ranked on a Likert scale from one to five) are: 1) My illness will improve a lot; 2) I will be able to cope with my illness better; 3) The symptoms of my illness will disappear; and 4) My energy level will increase. In this paper, statement 1 of the AES will be referred to as "Improve," statement 2 as "Cope," statement 3 as "Symptoms," and statement 4 as "Energy." The second part of the survey consisted of background information and self-

assessment questions to determine each patient's experience, knowledge, and relative level of exposure to acupuncture (for full survey and script, see Appendix 1).

In addition to age, gender, and the four items of the AES (and the AES sum), 11 other variables were recorded: Experience, Outcome, Number of Treatments (#Treatments), Preference, Source, Knowledge, Perceived Effect of Knowledge (PEK), Social Network Acupuncture Presence (SNAP), Spoken, Perceived Outcome (APO), and Acquaintance Perceived Effect (APE) (see Table 1).

Variable Term	Question to be answered
Experience	Has patient ever received acupuncture?
Outcome	If patient had previously received acupuncture, was it successful?
Number of Treatments	How many treatments (medical and/or non-medical, other than acupuncture) has patient previously tried for current symptoms?
Preference	Was the patient seeking acupuncture?
Source	How did patient learn about acupuncture?
Knowledge	How much does the patient feel he or she knows about acupuncture?
PEK	How does patient feel their knowledge affects their confidence in treatment outcome?
SNAP	Does the patient know someone who has received acupuncture?
Spoken	If yes to above, has the patient spoken to this person about their treatment?
APO	If yes to above, does patient feel that acupuncture was successful for this person?
APE	If yes to above, does patient feel that their acquaintance's experience has affected the patient's confidence in acupuncture?

Table 1. Variables and associated questions

Based on our hypotheses, each patient was included in three of six possible conditional groups based on how they responded to Experience, Preference, and SNAP (Figure 1). Patients who had never received acupuncture prior to participating in the study were labeled "Naïve," and patients who had received acupuncture (even if only for one session) prior to participating in the study were labeled "Exposed."

Patients who had been prescribed acupuncture were labeled "Prescribed," and patients who sought acupuncture were labeled "Seeking." Finally, patients who indicated they knew someone who has received acupuncture were labeled "Acquainted," while patients who indicated they did not know anyone who has received acupuncture were labeled "Unacquainted."
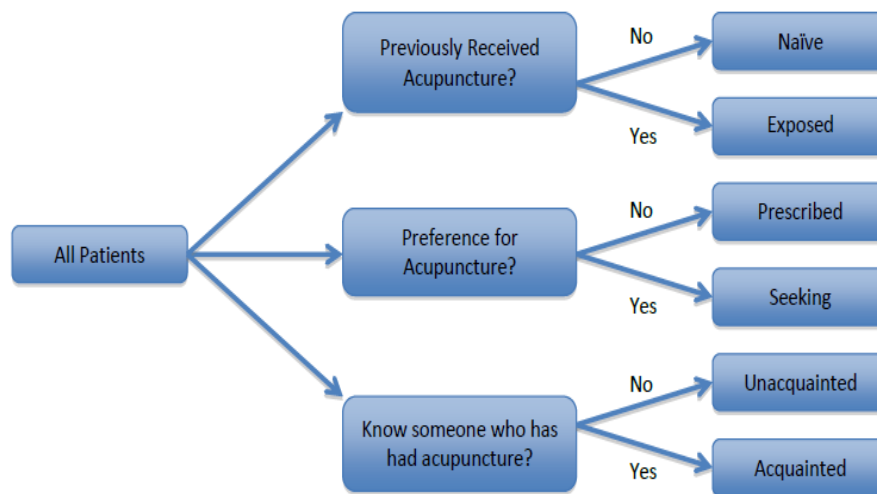

Figure 1. Flow chart diagram for conditional patient grouping

All non-scale responses (with the exception of Source) were assigned a numerical value on an appropriate scale of measure (i.e., nominal or ordinal) for statistical analysis. Spearman's rank correlations and descriptive statistics were calculated for all variables with IBM SPSS Statistics 21. Prospective power analyses conducted in G*Power 3.1[25,26] indicated that a minimum sample size of 32 patients was needed per each opposing condition (e.g., acupuncture-naïve or acupuncture-experienced) to detect an effect.

RESULTS
Eighty-five patients in total (52 women, 33 men) were surveyed, with a mean age of 53.5 years (standard deviation= 18.5 years). Fifty-three patients had previously received acupuncture, and 32 were naïve to acupuncture; 35 patients sought acupuncture, and 50 had been prescribed acupuncture; 65 patients knew someone who has received acupuncture, and 20 did not know anyone who has received acupuncture. For Exposed patients, 35 felt it had been successful, 12 felt it had not been successful, and 6 were unsure. Reported sources of learning were summarized as "have not learned about acupuncture" (n=3), "personal experience" (n=2), "popular culture" (n=29), "given information by someone" (n=60), and "personal research" (n=30). Patients performed self-assessments indicating whether they felt they knew "little to none" (n=38), "some" (n=41), or "a lot" (n=6) about acupuncture. One patient reported that their knowledge of acupuncture made them feel less

confident, while 43 patients reported that their knowledge made them more confident, and 41 patients reported that their knowledge made them neither more nor less confident in acupuncture.

For Acquainted patients, 58 patients had spoken with that person about their treatment, and 7 had not. Fifty-five Acquainted patients felt acupuncture had been successful for their acquaintance, 1 patient felt that acupuncture had not been successful for their acquaintance, and 9 patients were uncertain. Twenty-

one Acquainted patients felt that their acquaintance's experience had not affected their expectations, 40 patients felt that their acquaintance's experience had affected their expectations, and 4 patients were uncertain. AES means were within one standard deviation of, although consistently higher than, those previously reported[24] (see Table 2). Skewness was not greater than +/-1 for any AES item except for Cope (skewness= -1.01) of the Seeking group.

Patient Group	Improve (SD)	Cope (SD)	Symptoms (SD)	Energy (SD)	Sum (SD)
Exposed (n=53)	3.89 (0.89)	3.98 (1.03)	3.11 (1.19)	3.30 (1.34)	14.28 (3.67)
Naïve (n=32)	3.94 (0.80)	4.09 (0.78)	3.19 (1.03)	3.50 (1.27)	14.72 (3.00)
Prescribed (n=50)	3.76 (0.82)	3.98 (0.87)	2.90 (1.09)	3.24 (1.26)	13.88 (3.32)
Seeking (n=35)	4.11 (0.87)	4.09 (1.04)	3.49 (1.10)	3.57 (1.38)	15.26 (3.44)
Acquainted (n=65)	3.91 (0.82)	4.03 (0.85)	3.23 (1.07)	3.46 (1.29)	14.63 (3.25)
Unacquainted (n=20)	3.90 (0.97)	4.00 (1.21)	2.85 (1.27)	3.10 (1.37)	13.85 (3.95)
Overall (n=85)	3.91 (0.85)	4.02 (0.94)	3.14 (1.13)	3.38 (1.31)	14.45 (3.42)

Table 2. Acupuncture Expectancy Scale Means by Patient Group

Correlations:

To provide context, we labeled correlations as "strong" ($|r| \geq 0.70$), "moderate" ($0.50 \leq |r| < 0.70$), or "weak" ($0.30 \leq |r| < 0.50$),[27] and have presented them respectively in Tables 3–5; correlation values and confidence intervals can be found in Appendix 2.

Knowledge was weakly correlated with Experience for all relevant groups, moderately correlated with PEK for all groups, and moderately correlated with Outcome for Seeking and Unacquainted. PEK was moderately correlated with Improve, Cope, and AES Sum for Unacquainted. Spoken and APO were both strongly correlated with APE for Exposed, Naïve, and Prescribed. APE was weakly correlated with Symptoms and Preference for Naïve. Outcome was weakly correlated with Improve for Exposed, and with Preference for Acquainted, and Exposed. Neither #Treatments nor

Knowledge was correlated with any measure of expectations. Preference was weakly correlated with Symptoms for Acquainted and Naïve, and with AES Sum for Acquainted. APO was weakly correlated with Symptoms for Acquainted. There were a number of correlations observed specifically for Seeking: #Treatments was moderately correlated with Knowledge and weakly correlated with Outcome; SNAP, APO, and APE were moderately correlated with Symptoms and weakly correlated with AES Sum; APO was moderately correlated with APE and weakly correlated with Energy; Age was weakly correlated with Preference, and weakly inversely correlated with SNAP, APO, and APE. #Treatments was negatively correlated with Preference for Naïve, and Experience was negatively correlated with APE for Seeking.

Variables	Cope	AES Sum	APE	Key
Improve	A, E, P, S, U	A, E, N, P, S, U		A= Acquainted
Cope		A, E, P, S, U		E= Exposed
Symptoms		A, E, N, P, U		N= Naïve
Energy		A, E, N, P, S, U		P= Prescribed
Spoken			E, N, P	S= Seeking
APO			E, N, P	U= Unacquainted

*Strong values were selected as $| r | \geq 0.7$, all values were positive
Table 3. Strong* Correlations

Variables	Age	Improve	Cope	Symptoms	AES Sum	Knowledge	APE	Key
Gender	U							A= Acquainted
Cope		N						E= Exposed
Symptoms		E, P, U	E, P, U				S	N= Naïve
Energy		A, E, N, P, S	A, E, N	E, N, P, U				P= Prescribed
Outcome						S, U		S= Seeking
#Treatments						S		U= Unacquainted
PEK		U	U		U	A, E, N, P, S, U		
SNAP				S			S	
Spoken				S	S		S	
APO				S			S	

*Moderate values were selected as $0.5 \leq | r | < 0.7$, all values were positive
Table 4. Moderate* Correlations

Variables	Age	Gender†	Improve	Symptoms	Energy	AES Sum	Experience	Outcome	Preference	APO	Key
Improve		P			U			E			A= Acquainted
Cope		P, U		A, S	P, S						E= Exposed
Symptoms			A, N, S		A, S					A	N= Naïve
#Treatments		S						S	−N		P= Prescribed
Preference	U		A	A, N		A		A, E			S= Seeking
Knowledge							A, P, S, U	A, P			U= Unacquainted
PEK							A	A			
SNAP	−S					S					
Spoken			S		S						
APO	−S				S	S			E		
APE	−S			N		S	−S		N	A	

*Weak values were selected as 0.3 ≤ | r | < 0.5, minus (−) sign indicates a negative correlation for that group
†Positive gender correlations indicate women were more likely to provide a response
Table 5. Weak* Correlations

DISCUSSION AND CONCLUSIONS

Our study produced a fairly large amount of information, including several potentially important negative results. To aid in the interpretation of this data, we have presented our data in Tables 3-5 such that they can be read as conditional statements of the form "patients who Z were more likely to X if Y," where "X" and "Y" are variables, and "Z" is the condition of the group indicated in the tables above. For example, in the case of Outcome and Knowledge, patients who were seeking acupuncture and patients who did not know anyone who has received acupuncture were both more likely to report knowing more about acupuncture if they had previously experienced positive acupuncture outcomes. At the same time, patients who were prescribed acupuncture and those who did know someone who has received acupuncture were *also* more likely to report knowing more about acupuncture if they had previously experienced positive acupuncture outcomes, although to less an extent than that of the patients in the first case (Seeking and Unacquainted). Because the combined populations of each set of opposing conditional groups represents the overall population, we expect to see correlations in the overall population when both opposing groups exhibited a correlation. Conversely, we cannot assume a correlation in the overall population means that any or all groups exhibit this same correlation.

For Prescribed and Seeking, there were no correlations between Preference and any other variable, as all correlations with this variable were (by definition) 0 and 1 respectively for these groups. The same is true for correlations of Experience for Exposed and Naïve. For Naïve, Outcome was also not correlated with any other variable, as it was dependent upon the affirmative response to Experience. Similarly, while SNAP was not correlated with any other variable for Acquainted, in the case of Unacquainted, SNAP, Spoken, APO, and APE were not correlated with any variable (as the latter three variables were all dependent upon the affirmative response to SNAP). For those groups with variable predilections, a correlation indicates that the correlation was present for the relevant portion of the sample population (e.g., correlations of Outcome for the Exposed group).

Based on our results, we have come to the following conclusions regarding our initial hypotheses:

1. Patients who have previously received acupuncture are somewhat more likely than acupuncture-naïve patients to report having more knowledge about acupuncture.
2. Patients who are naïve to acupuncture are *not* more likely to be influenced by either a) knowledge of acupuncture, or b) experiences of people they know who have received acupuncture.
3. Patients for whom acupuncture was successful in the past are a) somewhat more likely to expect their illness to improve, and b) somewhat more likely to indicate a preference for acupuncture if they know someone else who has had acupuncture.
4. Patients who have tried more treatments for their symptoms are *not* more likely to have lower expectations.
5. Patients who report a preference for acupuncture are a) somewhat more likely to expect their symptoms to improve if they are naïve to acupuncture, or know someone who has had acupuncture, but b) are *not* more likely to report having more knowledge about acupuncture.
6. Patients who report having more knowledge are *not* more likely to have higher expectations.
7. Patients who know someone for whom acupuncture was successful are generally more likely to have higher expectations (particularly with regard to symptoms) if they have indicated a preference for acupuncture.

The correlation between acquaintance's outcomes (APO) and Symptoms suggests that for patients seeking acupuncture, social factors may have a significant influence on expectations that acupuncture will help improve their symptoms. This supports earlier findings that "those who described having close friends or family members who had used acupuncture… described anticipating… and wanting acupuncture to reduce their need for treatment by alleviating symptoms."[12] The importance of social networks in

treatment-seeking behavior may also be a result of Western medical education. Western medical students (and by extension, physicians) have reported knowing very little about acupuncture,[30] so it is possible that (many) physicians' lack of knowledge regarding acupuncture has resulted in a *de facto* reliance upon the social sphere to provide missing information. Social influence was not the only effect observed, however; patients who were seeking acupuncture were less likely to report being influenced by their acquaintance's experiences if they had previously received acupuncture themselves.

Perceived Effect of Knowledge (PEK) measured patients' confidence that their knowledge self-assessments were correlated with their AES scores. Unsurprisingly, the more that patients felt they knew about acupuncture, the more likely they were to believe that their knowledge had an effect on their expectations. However, there were no significant correlations between Knowledge and any measure of expectation or preference, consistent with research from other fields showing that self-assessments of knowledge are not effective at actually measuring knowledge,[28,29] but contradictory to findings that they exhibit "moderate to strong relationships with reactions, motivation, and self-efficacy." This contradiction suggests that, due to the many ways that people obtain and process knowledge,[31] studies involving knowledge may not be valid outside the original experimental context. Therefore, we recommend that future researchers take caution when interpreting our results, as well as those of other related studies.

There were a number of limitations to this study, chief amongst them being the presence of sampling bias. The patients all received treatment at the same outpatient medical center; while this ensures contextual consistency, it also introduces the possibility of contextual bias. All of the patients surveyed were patients of a single physician, and knew that they would be receiving acupuncture, as this was not a placebo-controlled study. All of the patients surveyed had agreed to receive acupuncture, regardless of their initial treatment preferences, and knew that they would be receiving acupuncture. This may have also created another bias in our results related to preference: actively seeking acupuncture was taken to indicate a preference for treatment, but a lack of initial preference for acupuncture does not necessarily imply any preference against it. Therefore, responses were generally more positive than those seen in and expected from the general population.[24] The binary nature of many of the variables also poses a limitation to the amount of information we were able to obtain. For example, it would be beneficial for future studies to record whether patients who had previously received acupuncture had completed a full series of treatments, or how many times they had received acupuncture.

In an attempt to keep our methods as consistent as possible, we used the original phrasing of the prompt and statements provided by Mao *et al.* for the AES portion of the survey.[16] Some patients disagreed with the terminology of the AES, in particular the word "illness," an issue the authors addressed in a follow-up study.[24] It is possible that this affected the responses provided by patients, and may explain the slight difference observed between our means and theirs. Additionally, our initial power analysis indicated that we would need a minimum of 32 participants for each category; this minimum was achieved for all groups except Unacquainted. Although there was an acceptable level of significance for the results we obtained ($p<.05$), because this category was underpowered, it is possible that the significance and correlational strength of some of these results was either over- or understated.

Based on our results, we have found that while moderate effects may be present for certain segments of the patient population, the factors affecting each patient's experience of and expectations for acupuncture cannot be easily generalized to the population. As with any correlational study, it is important not to assume that correlation implies causation; individuals who were more likely to provide a response if they met certain conditions did not necessarily provide that response *because* they met those conditions.

By incorporating qualitative factors into future studies, we may be able to better understand how the psychosocial aspects of acupuncture affect treatment responses and results in the clinical context. Our findings are consistent with those reported by earlier studies, indicating a continued need for additional studies of mechanisms of effect, and for more stringent requirements for reporting of data. These are necessary for reliability and trustworthiness in scientific literature, and it is important for authors to diligently record and provide information during all phases of testing in the future.

Investigators must take caution to avoid making incorrect generalizations based on circumstantial, context-specific evidence. We believe our study may help future practitioners and researchers avoid this mistake, and provide a guide for devising studies of patients' responses and expectations. Further testing is needed to show that our methods can determine comparability within and between patient populations. This is especially important in assessing clinical relevance, as an effective treatment must work consistently across different sociocultural contexts.

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