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Can pictorial images communicate the quality of pain successfully?

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Keywords

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Abstract

Chronic pain is common and difficult for patients to communicate to health professionals. It may include neuropathic elements which require specialised treatment. A little used approach to communicating the quality of pain is through the use of images. This study aimed to test the ability of a set of 12 images depicting different sensory pain qualities to successfully communicate those qualities.

Images were presented to 25 student nurses and 38 design students. Students were asked to write down words or phrases describing the quality of pain they felt was being communicated by each image. They were asked to provide as many or as few as occurred to them.

The images were extremely heterogeneous in their ability to convey qualities of pain accurately. Only two of the 12 images were correctly interpreted by more than 70% of the sample. There was a significant difference between the two student groups, with nurses being significantly better at interpreting the images than the design students. Clearly attention needs to be given not only to the content of images designed to depict the sensory qualities of pain, but also the differing audiences who may use them. Education, verbal ability, ethnicity and a multiplicity of other factors may influence the understanding and use of such images. Considerable work is needed to develop a set of images which is sufficiently culturally appropriate and effective for general use.

Key words:

Chronic pain, pain assessment, pain quality, pain measurement, images, neuropathic pain,

communication

Background

Chronic pain is common in the developed world. Studies from Europe[1] and the US[2] have reported a prevalence of one in five and one in three respectively, and it has been reported that chronic pain affects more than 14 million adults in England alone[3]. Neuropathic pain prevalence has been estimated to be around 8% within the general population[4,5]. It is often stated and has generally been accepted that pain is whatever the patient says it is. However, this is problematic when patients are unable to describe their pain verbally. There may be many reasons for this, including not speaking the host language, poor literacy, learning disability, dementia and conditions such as stroke that can cause communication impairments.

The quality of pain may be assessed using, for example, the multidimensional McGill pain questionnaire[6] or a neuropathic pain assessment scale such as the LANSS[7]. A review of neuropathic pain assessment instruments[8] described the key sensations caused by the two main types of pain – nociceptive and neuropathic. Neuropathic pain tends to be burning, tingling, numb, sensitive, electrical or cold; while nociceptive may be described as sharp, pressure, sore, shooting, achy, throbbing or dull. Patients who have mixed aetiology may experience sensations from both groups. The treatment for these two kinds of pain differs, so it is essential that the clinician is able to recognise the presence of nociceptive and/or neuropathic pain before deciding on an appropriate intervention.

An underused approach to communicating pain involves the use of images to depict pain qualities, although a small number of structured instruments have recently been developed for use with adults. Each of these instruments has a slightly different purpose and intended user. 'A better picture of chronic pain' developed by McAuley[9], was intended to assess the qualities of neuropathic pain in people with diabetes. One part of this tool comprises 12 images, six nociceptive and six neuropathic pain qualities. Although it was reported to be easy to use and effective by a small group of health care professionals, it appears not to have undergone psychometric testing with patients and its validity is unknown.

More recently, Lalloo and colleagues devised an Iconic Pain Assessment Tool [10,11]. IPAT2 was designed to assess the location, quality, and intensity of arthritis pain, using ten icons to represent pain quality, such as an ice cube to represent freezing. It was considered easy and quick to use and potentially valuable for communicating pain to health professionals, by a sample of 30 adults and adolescents. Difficulties in interpreting some of the icons (e.g. an archery type target for 'aching') were encountered. The small sample size, the focus on arthritic diseases and the ambiguity of some of the icons means the scale needs further development and testing before being used more widely.

Padfield[12] developed and tested a set of 64 photographic montage representations of pain in 54 patients with chronic pain and 52 clinicians and showed them to be of particular benefit in communicating the affective components of pain. However, their ability to differentiate between nociceptive and neuropathic pain was not reported.

These instruments are all in early stages of development, have different emphases, but hold promise. To date, no set of images has been systematically developed and psychometrically validated to support the effective communication of the sensory qualities of neuropathic pain to health professionals as an aid to diagnosis. This study, therefore, aimed to test the ability of one available instrument 'A better picture of pain'[9] to convey the sensory qualities of pain to healthy individuals with no communication difficulties, as a step towards the development of a more generic and validated tool.

Method

The ability of a 12 image set accurately to convey a range of sensory pain qualities was tested with an opportunistic sample comprising two groups of undergraduate students. The set comprised images taken from the series of cards developed by McCauley[9] for her instrument 'A better picture of pain'. The images were intended to convey burning, prickly, pins and needles, skin tingling/crawling, stabbing, shooting, shocklike, throbbing, aching, dull/numb, tightening/squeezing and cold (Appendix 1).

The images were presented to a total of 63 students, comprising 25 student nurses in the first session and 38 design students in the second. These groups were selected as we hypothesised that nursing students might be better prepared to understand the pain related components of each image while design students might have a better understanding of the pictorial elements. Images were presented both as a PowerPoint presentation and concurrently on paper as a simple questionnaire with a blank space beside each image to write down responses. Participants were informed that each image depicted a particular quality of pain, but no addition verbal description was provided for individual images. Images were presented one at a time and could be viewed for approximately one minute and were presented in the same order for each student group. This was the order in which they were presented in the original instrument. While the images were being projected, each student was asked to complete the questionnaire with words or phrases describing the quality of pain they thought was being communicated by that image. They were asked to provide as many or as few as occurred to them.

Participants' responses were scored and categorised independently by 3 of the co-authors, and any differences reconciled through discussion.

Institutional research ethics committee approval was gained prior to the study.

Results

The 63 students' understanding of the images was considered in several ways. First, we examined the accuracy of the participants' first, immediate response to each image; second we examined differences between the images' ability to elicit an accurate response; and third we examined possible differences between nursing and design students.

First response analysis

The immediate response of each participant to each image is shown in Table 1. The list of descriptors in the first column provides the intended meaning of each of the 12 images. The descriptors in the row across the top represent the first descriptor provided by each student to describe the image in question. The table also indicates where the participants provided a descriptor that matched another image in the set (a confusion response).

The images varied enormously in their ability to convey meaning accurately. It may be seen that cold, stabbing and burning were the most often scored correctly. At the other end of the spectrum dull/numb was interpreted correctly by only five people on their first attempt. There was a little overlap between a few of the images, such as prickly being interpreted as pins/needles, and shooting as pins/needles. On the whole there were few occasions when participants provided a confusion response.

Table 1 about here

Accuracy scores

A simple scoring system was devised, since there is no established method of assessing the accuracy of such images. If the first descriptor in their response (or set of responses) was correct (or a close derivative, e.g. burning, burn, burned), they scored 1. If they gave the correct descriptor on their second or subsequent response, they scored 0.5. Results are shown in Figure 1. It may be seen that images conveying cold, stabbing, burning, squeezing and pins & needles tended to be correctly interpreted more than the other images, while dull/numb was the least well interpreted, confirming the findings of the first response analysis.

The numbers of descriptors recorded varied considerably between images, from 0-4 (dull/numb) to 0-11 (pins/needles, tingling/crawling and tightening/squeezing). The proportions of the whole sample who gave correct responses on their first and on any subsequent response are shown in

Table 2. It may be seen that scores for each image all increased, but only slightly, when all responses were considered, compared with first response alone. Only five images (cold, stabbing, burning, tightening/squeezing and pins & needles) were correctly identified by half or more of the sample.

Figure 1 and Table 2 about here

Comparison of nursing and design students' ability to interpret images

The mean accuracy scores for each image, for both nursing and design students are shown in Figure 2. More nursing students were able to interpret the meaning of 11 of the images accurately than the design students, with the exception of 'cold'.

The scores for each of the 12 images image were then added together to give an indication of the comprehensibility of the set of images as a whole. The value of combining scores from the images may be questionable given their extremely varied comprehensibility. However, while this composite score would be meaningless in a clinical situation, it allowed for a simple comparison of the student groups. The range of scores possible was 0-12 and the mean number of correct answers per participant was 6.0 (SEM 0.3). There was a difference between the student groups in their ability to interpret the set of images, with a mean score of 7.9 (SEM 0.4) for nursing students and 4.8 (SEM 0.3) for design students (see Figure 3). A Mann-Whitney U-test showed this difference to be statistically significant ($p<0.0001$).

It was not only the accuracy of interpretation which differed between student groups, but also the number of descriptors recorded in response to each image (see Table 3). Nursing students generated more descriptors for all 12 images and the difference was statistically significant for burning, prickly, shock-like, dull-numb and throbbing.

Overall the findings show that the images varied greatly in their ability to convey qualities of pain accurately. Less than half of the sample was able to identify seven of the 12 images correctly (see

Table 4). The two groups of students differed from one another significantly, with nurses interpreting 11 of the 12 images more accurately than design students and also generating more descriptors overall.

Figure 2 and Table 3 about here

Discussion

We are not aware of a generally accepted threshold for accurate image interpretation. For the purposes of this study we suggest that for an image set to have clinical utility a criterion of 70% correct identification at first attempt would be the minimal level. Measured against this criterion, the present set of images falls short. Only 'cold' and 'stabbing' were recognised with this level of accuracy. This suggests that the set of images needs to be reconsidered and reconfigured.

All images may be open to different interpretations. The two groups studied here were young, mostly British and well educated university students, but despite these commonalities they showed considerable differences in their interpretation of the images. Nursing students were more accurate in their interpretation, which might be expected given that they were second years and were likely to have better health literacy than the first year design students. On the other hand, although the design students may have been less knowledgeable about health, they may have been more visually literate and perhaps more creative in their interpretations. The fact that the students were young and healthy with little previous experience of pain may have impeded their ability to translate the images.

These were small and opportunistic samples, but it is likely that the diversity of understanding in the wider population would be even greater. Different age ranges, ethnic and cultural diversity and education levels, disability and learning difficulties make this approach to communicating pain challenging. However, anecdotal conversations with members of a local pain support group indicated that even white, English-speaking and articulate members of the public were very positive about the idea of such an image-based instrument to help them communicate, in particular with their GP.

The range of words from which the images were derived may not have been optimum. Lin et al[8] and Jensen et al [13,14] both identified groups of commonly used words describing nociceptive and neuropathic pain qualities which overlapped with but are not identical with those used in this scale. Work is needed to identify first, those words which most robustly differentiate between the two kinds of pain, and second, the smallest clinically effective and acceptable number of descriptors required. These words may then be 'translated' into representative images, taking into consideration the health-related and cultural factors which may influence understanding.

The students' incorrect responses to the images were of as much, if not more interest than the correct ones, as they were likely to indicate which aspect of each image was either misleading, ineffective or otherwise requiring refinement. While the images were designed primarily to illustrate the sensory qualities of pain, the words in the participants' responses covered a much wider range of attributes, including not only sensory attributes but also location, affective and temporal qualities, as well as literal, narrative type descriptions of the images, and those describing another (not necessarily painful) health condition. The implications of these incorrect responses and their association with the visual elements of each image will be reported separately.

In conclusion, 'A better picture of pain' contained only two images (cold and stabbing) out of 12 which were accurately understood by (70% or more) of a sample of young, healthy adults. Nursing and design students differed significantly in their ability to interpret the images. Clearly attention needs to be given not only to the content of images designed to depict the sensory qualities of pain, but also to the differing audiences who may use them. Education, verbal ability, ethnicity and a multiplicity of other factors may influence the understanding and use of such images. Considerable work is needed to develop and test a set of images which is both culturally appropriate and sufficiently effective for general use.

Declaration of conflicting interests

The authors declare that there are no conflicts of interest.

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Table 1: First descriptor given by participants for each pain image (n=63).

Images	**Responses**											
	Cold	Stabbing	Burning	Tightening/ squeezing	Pins & needles	Shooting	Prickly	Throbbing	Aching	Skin tingling/ crawling	Shock-like	Dull/ numb
Cold	51											
Stabbing		47			1							
Burning			40								1	
Tightening/ squeezing				34		1						1
Pins & needles					31	3	3			1		2
Shooting						21	2					
Prickly							20					
Throbbing								18	1			
Aching								1	17			1
Skin tingling/ crawling										14		
Shocklike						1					13	
Dull/numb			1									5

Table 2: Accuracy scores for each image (n=63)

Image	Proportion of whole sample who gave correct first response	Proportion of whole sample who gave correct first or subsequent response	Mean accuracy score (SEM) (Range 0-1)	Number of different incorrect 1st response descriptors given (n times chosen)
Cold	0.83	0.87	0.87 ±0.04	9 (13)
Stabbing	0.74	0.79	0.79 ± 0.05	12 (19)
Burning	0.65	0.75	0.77 ± 0.04	12 (25)
Tightening/squeezing	0.57	0.70	0.66 ± 0.05	16 (27)
Pins and needles	0.52	0.57	0.59 ± 0.06	17 (25)
Prickly	0.35	0.43	0.44 ± 0.06	14 (35)
Aching	0.27	0.43	0.36 ± 0.05	22 (36)
Shooting	0.33	0.41	0.37 ±0.06	28 (36)
Skin tingling / crawling	0.24	0.40	0.33 ± 0.05	17 (49)
Throbbing	0.29	0.35	0.33 ± 0.06	27 (41)
Shock-like	0.24	0.33	0.37 ± 0.05	21 (43)
Dull/numb	0.08	0.13	0.15 ± 0.04	33 (38)

Table 3: Differences in the mean number of different descriptors given by nursing (n=25) and design (n=38) students for each image

Image	**Nursing:** **mean (SEM)**	**Design:** **mean (SEM)**	**Mann-Whitney U test** **probability**
Burning	5.3 (0.5)	3.3 (0.2)	p=0.001
Prickly	4.0 (0.4)	2.6 (0.2)	p=0.004
Shock-like	3.3 (0.3)	2.1 (0.2)	p=0.006
Dull-numb	3.2 (0.5)	1.6 (0.2)	p=0.009
Cold	3.1 (0.3)	2.8 (0.2)	p=0.483
Stabbing	3.1 (0.4)	2.3 (0.2)	p=0.117
Throbbing	3.0 (0.2)	1.9 (0.2)	p=0.001
Squeezing	2.8 (0.2)	2.6 (0.2)	p=0.347
Pins & needles	2.2 (0.3)	2.2 (0.3)	p=0.599
Tingling/ crawling	2.6 (0.3)	2.3 (0.2)	p=0.175
Aching	2.6 (0.3)	2.4 (0.2)	p=0.546
Shooting	2.3 (0.3)	1.8 (0.2)	p=0.384
Total	*37.6 (3.0)*	*28.0 (1.4)*	*p=0.008*

Figure 1: Mean accuracy scores for each image (n=63). (Vertical bars represent the 95% confidence interval)

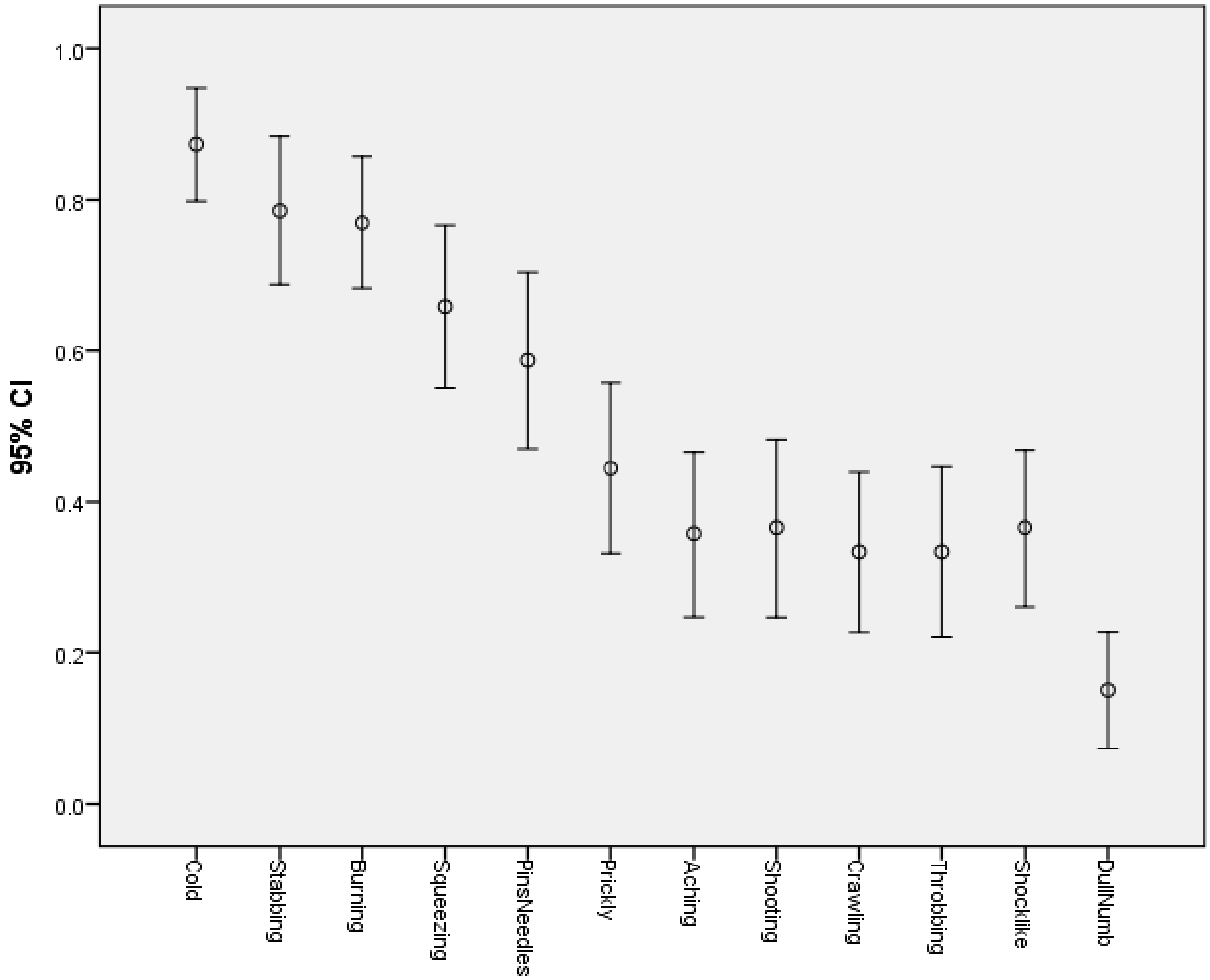


Figure 2: Comparison of nursing (n=25) and design students' (n=38) accuracy scores for each image

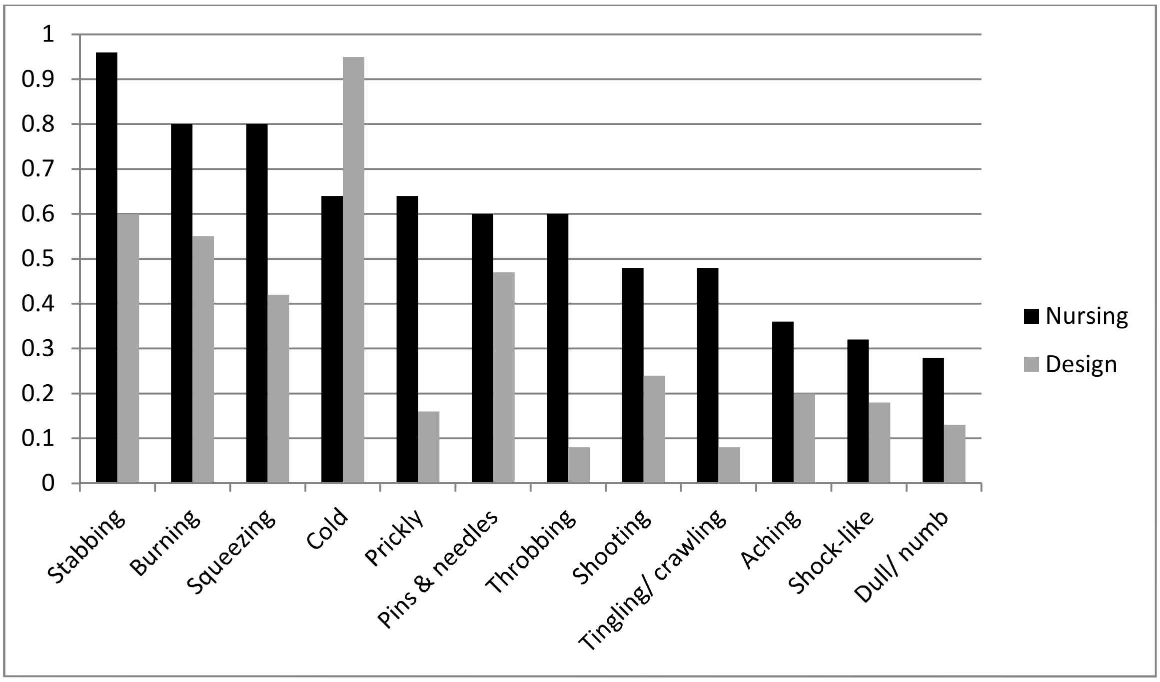
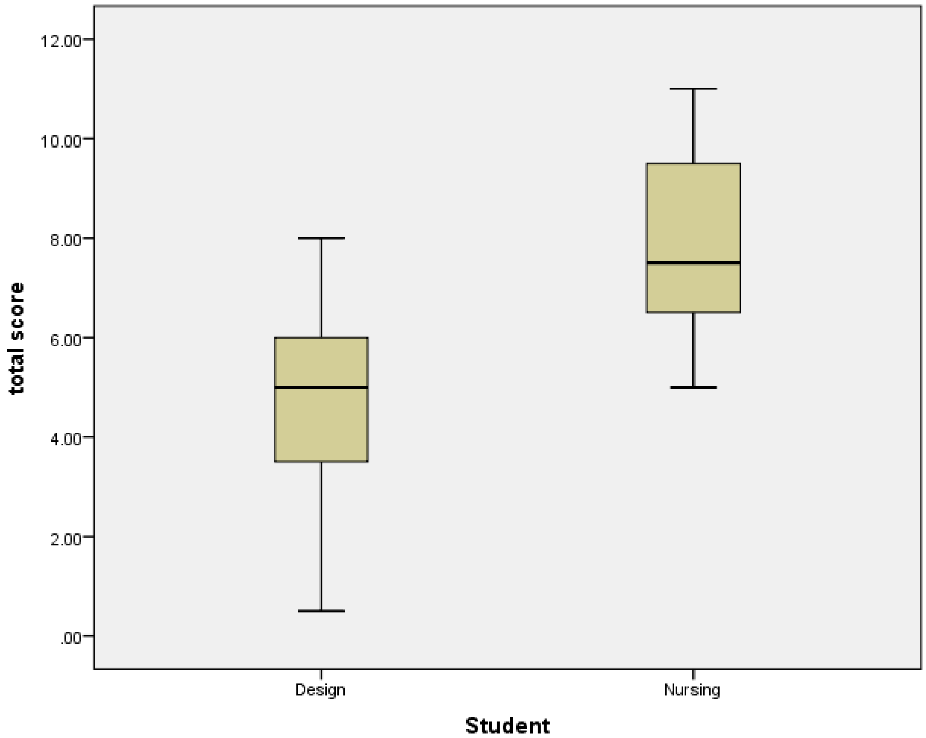
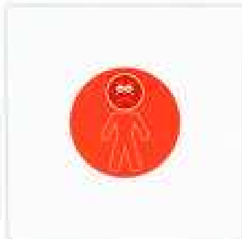
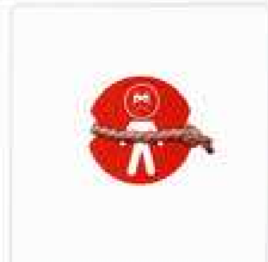
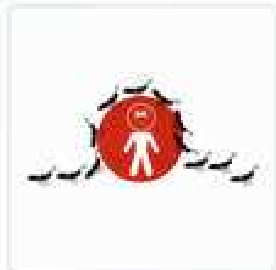


Figure 3: Box plots of accuracy scores for the two student samples:



(Box indicates median between first and third quartiles; whiskers indicate maximum and minimum scores)

Appendix1: Images included in the ‘Better Picture of Pain’ instrument		
Burning 	**Stabbing** 	**Aching** 
Prickly 	**Shooting** 	**Dull/numb** 
Pins and needles 	**Shock like** 	**Tightening/ squeezing** 
Skin tingling/crawling 	**Throbbing** 	**Cold**