ELSEVIER

Lingua 95 (1995) 259–278

Lingua

The basic colour terms of Chichewa☆

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Received October 1993; revised version September 1994

Abstract

We report a field study of the colour tems of Chichewa. Our results identify the colour term inventory of Chichewa and permit a further test of Berlin and Kay's (1969) theory of colour universals. Two samples of Chichewa speakers – a rural sample and a sample of university students – performed a list task ("tell me as many colour terms as you know"), and the rural sample also performed a colour mapping task. The list task elicits the most salient colour terms, and the mapping task allows the referents and the best exemplars of each term to be determined. The results indicate that Chichewa has five basic colour terms – terms for white, black, red, grue (green with blue) and yellow – a combination which is consistent with Berlin and Kay's theory. The range of signification of these terms is wider than is suggested by the English glosses, and there is some evidence that their ranges may be narrowing as the language acquires new terms.

1. Introduction

Berlin and Kay's (1969) theory of colour universals continues to stimulate research. Its great insight was that there was strong regularity underlying the apparent diversity of colour categories across languages. Most languages studied since 1969 fit the theory to at least a first approximation, but there have been few field studies of the languages of Africa seeking to test the generality of the theory. The work we report here is such a field study, which examines colour terms in Chichewa, spoken in Malawi in Central Africa. It is one of the dialects of the Bantu language which is called 'Chinyanja' or 'Nyanja' in neighbouring Zambia, Zimbabwe and

☆ This work was supported by the ESRC, grant numbers: R000 23 1958 and R000 23 3978. We gratefully acknowledge this support.
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SSDI 0024-3841(94)00024-7

Mozambique. Since our informants were from Malawi we use the term Chichewa. But before describing the study in detail, we describe the Berlin and Kay theory in outline, indicating what kinds of colour categories might be expected in Chichewa and what they might denote.

Before Berlin and Kay (1969), the prevalent belief was that the physical continuum of colour was arbitrarily segmented into categories; thus different languages imposed different categorical structures on the colour continuum without constraint. But, according to Berlin and Kay (1969), rather than being arbitrary, all colour term inventories are drawn form a severely restricted subset of those which might have been expected. Fig. 1 shows the Berlin and Kay hierarchy which represents 'permissible' combinations of 'basic' (the most important) colour terms.

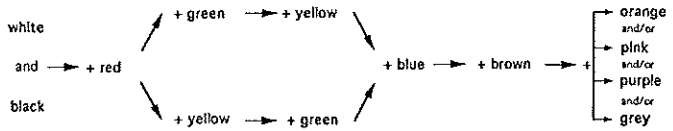

Fig. 1. The Berlin and Kay Hierarchy of basic colour terms.

According to the theory, if a language has 'n' basic colour terms, then these should be the first n terms counting from the left on the hierarchy. For example, if a language has just two basic colour terms, then these should be white and black (light and dark) and if a language has three colour terms, then these should be white, black and red; a four-term language could have either green or yellow in addition to the terms for a three-term language; and so on up to the theoretical maximum of eleven basic terms. As well as these synchronic predictions, the theory also makes diachronic predictions about the evolution of colour term inventories: colour terms are acquired in the order indicated by the hierarchy.

The concept of basic colour term is central to the theory. Basic colour terms are: 'monolexemic' (in that the meaning is not derivable from the parts of the term); their signification is not included in that of another term; their use is not restricted to a narrow range of objects; and they are psychologically salient (but see Crawford, 1982, and Moss, 1989, for criticisms of these criteria).

Kay and McDaniel (1978) proposed that colour categories differed in kind as well as in referents: they distinguished between primary, composite, derived and secondary colour categories. Primary colour categories are those designated by the first six terms in the hierarchy. They are perceptually and neurologically fundamental: they appear to be encoded in separate neural channels and are perceptual 'primitives' (see Jameson, 1985, for an outline of our current understanding of the neurophysiology of colour vision and its relationship to Hering's 1920 opponent process theory of colour vision). Derived categories are designated by the last five terms on the hierarchy, and according to the theory are derived from the primary categories as 'perceptual blends'; so for example, orange is the derived category arising from the

blend (or fuzzy set intersection) of the primary categories red and yellow. Composite categories also arise from combinations of primary categories, but now these are 'unions' of two or more primary categories; for example 'grue', green with blue, refers to the whole blue-green region. Kay and McDaniel argued that languages evolved from a state with just two composite categories – light and dark – which bisected the whole domain, by successive decomposition of composite categories through to the state where they designated six primary categories, followed by the development of the derived colour categories through to the state with eleven basic terms. Secondary terms are non-basic categories wholly subsumed within the meaning of a basic category, such as scarlet in English: scarlet is a specific instance of the basic category red. For a statement of Berlin and Kay's more recent position see Kay et al. (1991). For interesting developments of the theory see MacLaury (1991, 1992); Boynton and Olson (1987) introduced behavioural techniques for investigating basic colour terms, and the different types of measures of basicness are discussed in Corbett and Davies (forthcoming).

If the theory is correct, then all languages with less than six basic terms should include at least one composite category; this would be indicated by the region covered by one or more of the basic terms encompassing at least two of the foci of the eleven universal categories. For example, Setswana has a category *bothala* 'grue' which clearly includes the foci of blue and green (Davies et al., 1992). Our Chichewa-speaking colleagues suggest that Chichewa has such composite categories; the most likely instance is the grue category, and one reason for studying the language is to establish whether this is the case or not. A second reason is that many central and southern African languages are in transition under the impact of English and other European languages. We found that Xhosa, one of the main languages of South Africa, may be undergoing a transition from having a composite grue term through to separate blue and green categories, by importing a blue term from English or Afrikaans, leaving the traditional term *hlaza* to denote green (Davies and Corbett, forthcoming). We were interested to see if an equivalent transition, or the decomposition of other composite categories, might be happening to Chichewa. One way of approaching the possible transitions in the language is to compare a 'traditional' rural group with university students, a group who might indicate the way the language was changing.

Accordingly, we tested two samples of Chichewa speakers, a rural sample and a sample of university students, using procedures similar to those that we used in our study of Setswana (Davies et al., 1992; in press), and Xhosa (Davies and Corbett, forthcoming). We used two main tasks: a colour list task and a colour naming task. The colour list task was suggested by Berlin and Kay as a measure of salience and we used this with both sets of informants. The colour-naming task was used to establish the referents of the colour terms, to measure the frequency with which terms are used, and to estimate the levels of consensus as to what terms denote; this was used just with the rural sample. It would be expected that basic terms would occur in most informants' lists (and in high positions on these lists) and that there would be good agreement across speakers as to what the terms denote (compare Berlin and Kay, 1969: 6). In addition we report data on a 'colour-blindness' test for the rural sample.

2. Method

2.1. Subjects

There were 83 subjects in total, 40 from rural Malawi, and 43 who were University students at Zomba in Southern Malawi studying Chichewa. The rural sample did three tasks: colour term lists, a colour vision test and a colour-naming task. The student sample did only the list task. The rural sample consisted of 26 women and 18 men; their mean age was about 40 years (not all were sure of their age) and their ages ranged from 18 to 82 years. They were all native Chichewa speakers, and none knew more than a little English. The student sample were aged between 18 and 25 years and consisted of approximately equal numbers of men and women (43 in total). They were living in Zomba while studying, but were drawn from most regions of Malawi. All had some knowledge of English but Chichewa was their first language in all cases.

2.2. Stimuli

The stimuli in the colour-naming task consisted of 65 'colour tiles'. These tiles were squares of coloured paper (50mm × 50mm), mounted on 3mm thick plywood; the tiles were sprayed with a light film of transparent varnish to protect them from staining during use. The tile colours were an evenly spread sample of 'colour space' taken from the Color-Aid corporation range. Table 1 gives the Color-Aid codes and the CIE coordinates for the tile colours, and Fig. 2 shows their distribution in CIE chromaticity space, together with the loci of the 11 'universal' foci, taken from Heider (1971).

The CIE chromaticity coordinates can be thought of as the proportions of red (x), and green (y), in each colour; a third coordinate, lightness or reflectance (Y) makes up the CIE tri-stimulus values. By implication, the proportion of blue light is given by 1-(x+y).[1] Every possible colour has a unique locus in three-dimensional (Y, x, y) space and these tri-stimulus values may be used to convert the Color-Aid stimuli into the more familiar Munsell, or OSA systems, through conversion tables in, for instance, Newhall et al. (1943). Note however that this tri-stimulus space is not an equal 'perceptual' space; that is, equal distances do not correspond to equal perceptual steps. The Color-Aid range is based on the Ostwald colour solid (see Foss et al. (1944) for an outline of this system) and is made up from 24 'HUEs': Y (yellow), O (orange), R (red), V (violet), B (blue) and G (green), plus intermediate values desig-

[1] Within the CIE system the total colour is made up from red, green and blue components, and the proportions of these three must sum to one. For instance, in Fig. 2, the universal blue (number 5) has coordinates of 0.18 (x), 0.19 (y). The proportion of blue is thus: 1– (0.18+0.19) = 0.63. Thus, as would be expected, the universal blue has a high proportion of blue in it, and blue colours are to be found towards the origin of the graph. On the other hand, red colours have high proportions of red in them and are to be found toward the right of the graph (number 2). The positions of the 11 universal foci in Fig. 2 can be used to interpret the remaining regions of the CIE chromaticity diagram.

Table 1
Color-Aid codes and CIE coordinates for the tile-colours

Color-Aid code		C.I.E coordinates		
		Y	x	y
		brightness	redness	greenness
Y	HUE	64.77	0.47	0.48
	S2	16.99	0.41	0.44
YOY	HUE	47.48	0.50	0.43
	T4	55.63	0.45	0.41
	S2	22.08	0.36	0.38
YO	HUE	39.52	0.51	0.41
	T3	47.02	0.48	0.41
	S3	10.72	0.36	0.41
OYO	HUE	26.51	0.54	0.37
O	HUE	25.00	0.54	0.37
	S1	14.34	0.50	0.37
	S3	9.15	0.42	0.36
ORO	HUE	18.87	0.57	0.34
	T3	36.88	0.46	0.35
	S3	26.51	0.33	0.32
RO	HUE	16.22	0.58	0.33
	T3	32.66	0.45	0.32
	S3	4.19	0.37	0.34
ROR	HUE	15.23	0.53	0.31
	T3	29.82	0.42	0.30
	S3	20.71	0.34	0.28
R	HUE	11.71	0.50	0.29
	T4	24.34	0.40	0.27
	S3	4.81	0.33	0.30
RVR	HUE	9.11	0.42	0.24
	S1	12.79	0.35	0.25
	S3	28.43	0.36	0.28
RV	HUE	6.97	0.33	0.19
	T2	14.51	0.31	0.19
VRV	HUE	6.71	0.30	0.19
	S3	28.42	0.36	0.28
V	HUE	4.67	0.26	0.17
VBV	HUE	4.13	0.24	0.17
	T4	19.05	0.25	0.20
BV	HUE	4.21	0.22	0.19
	S2	7.88	0.25	0.26
BVB	HUE	4.80	0.19	0.13
	S3	26.65	0.26	0.23
B	HUE	9.51	0.18	0.16
	T1	19.02	0.20	0.19
BGB	HUE	9.62	0.19	0.19
	T3	23.08	0.20	0.23
BG	HUE	8.93	0.20	0.25
	T1	16.57	0.19	0.25
	S2	7.42	0.21	0.26

(Table 1 continued)

Color-Aid code		C.I.E coordinates		
		Y	x	y
		brightness	redness	greenness
GBG	HUE	10.69	0.23	0.37
	S2	20.79	0.20	0.25
G	HUE	11.99	0.24	0.42
	S3	6.10	0.26	0.33
GYG	HUE	12.89	0.25	0.44
	T4	31.14	0.26	0.41
	S1	15.59	0.26	0.31
YG	HUE	14.66	0.28	0.48
	S3	5.78	0.30	0.34
YGY	HUE	18.92	0.30	0.51
	S3	35.87	0.35	0.43
ROSE RED		17.63	0.41	0.24
WHITE		81.40	0.32	0.33
SIENNA		13.31	0.44	0.36
BLACK		3.59	0.34	0.33
GRAY 2		30.59	0.32	0.33
GRAY 1		47.55	0.32	0.33
GRAY 4		18.88	0.31	0.31
GRAY 6		11.20	0.31	0.31
GRAY 8		4.53	0.31	0.32

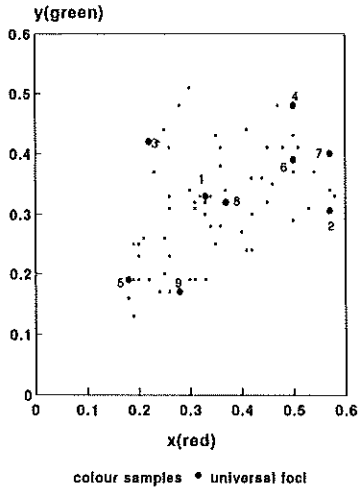

Fig. 2. Loci of the colour samples and the universal foci. 1 = achromatic (white, black and grey), 2 = red, 3 = green, 4 = yellow, 5 = blue, 6 = brown, 7 = orange, 8 = pink, 9 = purple.

nated by combinations of the previous codes; for instance YOY, YO, and OYO are the intermediate HUEs between Y and O. In addition to the HUEs there are seven variants of each HUE consisting of four 'tints' T1 to T4, and three 'shades' S1 to S3; the tints have increasing amounts of white added to the HUE as their index number increases, whereas the shades have increasing amounts of black added as their index number increases. In addition, there is also a 'grey-scale' and a number of colours of particular significance to painters.

The colour vision of subjects was assessed using the City University Colour Vision Test (Fletcher, 1980). This is a quick and simple test of colour vision, which requires no literacy, and produces a preliminary indication of any colour vision anomalies. It produced estimates of the extent of the relatively common anomalies, protanopia and deuteranopia (red-green anomalies) and of the much rarer anomaly, tritanopia (blue-yellow anomaly). The test consists of ten 'plates' each consisting of a colour spot and four surrounding spots; the task is to point to the surrounding spot which is most like the centre spot.

2.3. Procedure

The same experimenter, one of the authors, conducted all phases of the study; his first language is Chichewa. The rural subjects did the tasks in the order: lists, colour naming, City University Colour Vision Test. They were tested inidividually, outdoors in light shade, typically on the veranda of their house, and instructions were given in Chichewa.

In the list task, they were asked "please tell me as many colour terms as you know". The experimenter wrote down their responses, encouraged them to continue if they paused, and moved on to the next task when they said they had finished. The task generally took less than two minutes. In the colour-naming task, they were shown each of the 65 tiles, one at a time, on a piece of grey cloth, in a different random order for each subject. They were asked "what do you call this colour?" All responses, including "don't knows" were recorded. The naming task took about 20 minutes. In the City University Colour Vision Test they were shown one plate at a time, and asked to point to the colour most like the one in the middle. This task generally took about two to three minutes.

The student sample were tested together in a lecture room at the University, and did only the list task. They were given the equivalent instructions to the rural sample, but wrote rather than spoke their responses. These were written in columns so that it was possible to recover the order in which colour terms were written.

3. Results

Colour terms were usually given by informants with the prefix *chi-*, or *cha-* or *cho-* (occasionally other prefixes were given). In the case of *(cha-)khofi* 'coffee' and *(cha)khaki* 'khaki' the prefix *cha-* was sometimes included and sometimes not. In the results in Table 3, the distinction is maintained, while elsewhere the prefixed and unprefixed forms are treated together.

3.1. Lists

The respondents in the rural sample offered 6.2 terms on average, and the scores ranged from 4 to 8 terms. Men and women offered about the same number of terms; the mean scores were: 6.1 for men and 6.3 for women. The student sample offered significantly more terms than the rural sample: their mean score was 9.4; the range was from 6 to 15 terms.; t=8.1, df=81, p<0.00009.

Table 2 shows the 20 terms that were offered by at least three people in either sample, the English glosses, the frequency with which the terms were offered and the mean position in the lists, for each sample separately. The terms are given in order of the frequency with which they were offered by the rural sample. Any combinations of words offered such as *chofiira motuwa* 'greyish red', *chofiira pang'ono* 'slightly red', or *chofiira monwira* 'dark red' have not been included in the table. Such combinations were offered rarely by the rural sample, but made up just over 10% of student responses. Even so, no particular combination was offered by more than three people in either sample.

Table 2
List task scores. The frequency and mean position for each term offered by at least three people from either sample, for the rural and the student samples.

Term	Gloss	Rural sample		Student sample	
		Frequency	Mean position	Frequency	Mean position
Chofiira	Red	40	2.9	43	2.5
Chakuda	Black	38	3.3	41	3.0
Choyera	White	35	3.7	42	2.4
Chobiriwira	Grue	33	2.8	41	4.5
Chikasu	Yellow	33	3.2	38	4.0
Chotuwa	Grey	24	4.3	24	6.8
(Cha-)khofi	Coffe	11	5.2	12	7.5
Chamtambo	Sky blue	8	5.9	10	6.8
Chamasamba	Leaf green	5	5.3	2	6.2
(Cha-)khaki	Khaki	3	4.5	9	8.1
Chamawangamawanga	Spotted	3	5.1	10	5.9
Chaphulsa	Ash grey	3	4.3	1	7.0
Chabuluu	Blue	1	4.5	15	8.3
Chanyezinyezi	Shiny	1	9.0	15	6.8
Chagirini	Green	1	4.3	6	7.8
Chamandalasi	Coloured	0		7	7.2
Chapinki	Pink	0		4	8.5
Chakanthochi	Yellow (banana)	0		3	6.3
Chakhanga	Spotted	0		4	7.0
Chagre	Grey	0		3	6.9

It can be seen that the first six terms: *chofiira* 'red', *chakuda* 'black' *choyera* 'white', *chobiriwira* 'grue' (green with blue), *chikasu* 'yellow' and *chotuwa* 'grey' are the six most frequent terms for both groups, and the rank orders of the frequencies are very similar for the two groups. Each of these six terms was offered by over half of each sample, whereas no other term was offered by more than about one third of either sample. All these six terms are traditional Chichewa terms. There is a relatively sharp drop in both frequency and list position, for both samples, after the fifth term, *chikasu* 'yellow', and another one after the sixth term, *chotuwa* 'grey'. In fact, just the first five terms make up over 70% of the responses for the rural sample, although this proportion is somewhat smaller – 50% – for the students.

Just on the basis of the list measures, the first five terms in Table 2 are the strongest contenders for basic colour term status in Chichewa. If we accept for the moment that these terms are the basic ones, then Chichewa fits the Berlin and Kay theory well: the five most frequent terms form a 'permissible' combination for a five-term language. Strictly the scores for *choyera* 'white' and *chakuda* 'black' should be greater than for *chofiira* 'red', but this discrepancy in the scores is small.

The greater number of terms offered by the students arises for three main reasons. First, students offer many more combinations of terms and qualified colour terms. Second, they offer non-basic traditional terms such as *chamawangamawanga* 'spotted' and *chamizeremizere* 'shiny' more frequently than the rural sample. And finally, they offer more borrowed terms than the rural sample; *chabuluu* 'blue' is the most common of these but a 'Chichewacised' version of all the basic colour terms of English, with the exceptions of white, black and red, was offered at least once. There are also interesting data on the terms offered by the students for blue and green, which we take up in section 4.

3.2. Colour naming

Only the rural sample did the naming task; there were only seven missing responses out of a total possible response set of 40 respondents by 65 colours. There were three main kinds of responses: (1) a simple colour term such as *chofiira* 'red'; (2) an attenuated form of the colour term, for example, *chofiirira* 'reddish';[2] (3) a qualified term such as *chofiira modera* 'darkish red' or *chofiira chiri chachikasu* 'red with yellow'. The attenuated form was a particularly common variant for *chofiira* 'red', *chobiriwira* 'grue' and *chotuwa* 'grey', but in general, for most colour tiles, attenuated forms were given less frequently than simple forms.

Table 3 gives the most frequent term given for each colour tile and the second most frequent term, provided it was given by more than one person, together with the Color-Aid codes for each tile. If there were tied frequencies for first or second place, then we give all of the tied terms. Next to each term is the frequency with which it was given. Thus, for example, the tile – O HUE was named *chofiira* 'red' 24 times and *chofiirira* 'reddish' nine times. Fig. 3 shows the locations in CIE chromaticity space of the stimuli for which there was a reasonable consensus over how they should be called; the criterion for this reasonable consensus will be explained shortly.

Inspection of Table 3 and of Fig. 3 will indicate that six of the seven most prevalent terms on the list task (Table 2) – *chofiira* 'red', *chakuda* 'black', *chobiriwira* 'grue' (green with blue), *chikasu* 'yellow', *chotuwa* 'grey' and *(cha-)khofi* 'coffee' are also the six most frequent on the naming task (the exception is *choyera* 'white'). And just these terms plus *choyera* 'white' show high consensus of use.

This claim can be evaluated more easily by considering Table 4: here we show the total number of times the simple form, the attenuated form and the sum of both forms were given, for each term summed across tile colours and respondents. The terms are ordered by the frequency with which they were given by the rural sample in the list task (Table 2). It can be seen that with the exception of *choyera* 'white', the terms with the highest frequencies on the list task (Table 2) also have the highest frequencies on the naming task; this is so for the frequency of the simple form and for the total frequency. Thus, *chofiira* 'red', *chakuda* 'black', *chobiriwira* 'grue', *chikasu* 'yellow', *chotuwa* 'grey' and *(cha-)khofi* 'coffee' were six of the seven highest scoring terms on the list task, and they have the six highest simple-form frequency scores (column 1) and also the six highest total-frequency scores (column 3).

In combination, the total frequencies for these six terms make up 83.5% of the total responses. *Choyera* 'white' scores lower than *chamtambo* 'blue' on the simple form measure and on the total measure, and less than *chamsamba* 'green' on the total frequency measure. In addition to these differences, the rank orders of the terms on the frequency measures vary somewhat from the rank order in Table 2: this is primarily due to the relatively low scores for *choyera* 'white' and *chakuda* 'black', but in addition *chotuwa* 'grey' has a higher positon than in Table 2 (it comes third in terms of the frequency of the simple form and the total frequency, whereas it ranks sixth in the list task).

Basic therms should be both salient and show good agreement across respondents: our frequency measures are primarily further measures of salience, albeit constrained by the particular colours in the stimulus set. We next consider how the degree of consensus may be estimated: first, in Table 4 column 4, we give the number of tiles for which a given term was the most frequent term; in general, the most frequent term is the simple form, but, for *chofiira* 'red' the version *chofiirira* 'reddish' was the most frequent term for 11 tiles (we return to this later). It can be seen that only the first seven terms have a score greater than zero; *chofiira* 'red' and *chobiriwira* 'grue' have clearly the highest scores (19 and 21 respectively), whereas *choyera* 'white' has just one tile for which it is the most frequent term.

[2] Attenuated forms are created by the addition of the suffix *-ir-/-er-*. The form is determined by vowel harmony: *-ir-* is found if the preceding vowel is high or low (i/u/a) while *-er-* is found after the mid vowels (e/o). Thus, *chotuwa* 'grey' gives *chotuwira* 'greyish', while *choyera* 'white' has *choyerera* 'whitish'. A more complex case is *chakuda* 'black', whose attenuated form is *chodera* 'blackish'. This has the following components (the root is *-d-* 'black'):

chi	+	a	+	ku	+	d	+	(i/e r)	+	a
gender/number prefix	+	adjectival vowel	+	infinitive prefix	+	root	+	(attenuating morpheme)	+	final vowel

In the attenuated form, a + ku gives o, by regular morphological rule, and chi + o gives cho. The form of the attenuating morpheme is -er- by vowel harmony. But in the simple form, the -ku- cannot be reduced because of the requirement that minimal words must be bisyllabic.

Table 3
Tile naming.
The most common terms given to the tiles, and the frequency with which they were given (F).
Tiles are labelled with their Color-Aid codes; glosses are given in Table 4.

Code	Term	F	Code	Term	F	Code	Term	F
Y HUE	chikasu	39				S2	chotuwa	5
							chobiriwira	4
							chobiriwira-pang'ono	4
YOY HUE	chikasu	34	T4	chikasu	32	S2	chotuwa	7
	chofiira-pang'ono	2		chikasu-chotuwa	3		chobirirwira-pang'ono	6
YO HUE	chikasu	27	T3	chikasu	29	S3	chobiriwirira	8
	chofiirira	3		chikasu-chofiira	2		chobiriwira	7
OYO HUE	chofiira	15						
	chikasu	11						
O HUE	chofiira	24	S1	chofiirira	6	S3	khofi	16
	chofiirira	9		chofiira-khofi	5		chakhofi	4
ORO HUE	chofiira	31	T3	chofiirira	18	S3	chotuwira	12
	chofiirira	8		chofiira	9		chotuwa	9
RO HUE	chofiira	35	T3	chofiirira	18	S3	chakuda	14
	chofiirira	2		chofiira	11		chodera	9
ROR HUE	chofiira	35	T3	chofiirira	14	S3	chofiirira	12
	chofiirira	4		chofiira	7		chotuwa	10
R HUE	chofiira	28	T4	chofiirira	14	S3	khofi	10
	chofiirira	9		chofiira	11		chodera	9
RVR HUE	chofiirira	18	S1	chofiirira	14	S3	chofiirira	15
	chofiira	13		chofiira	8		chotuwa	7
RV HUE	chofiirira	16	T2	chofiirira	19			
	chofiira	9		chofiira	7			
VRV HUE	chofiira	8				S3	chofiirira	12
	chofiirira	8				S3	chofiirira	12
	khofi	6					chotuwa	7
V HUE	chodera	6						
	chofiirira	6						
VBV HUE	chobiriwira	10	T4	chotuwa	6			
	chodera	6		ngati khofi	6			
				chotuwira	5			

(Table 3 continued)

Code	Term	F	Code	Term	F	Code	Term	F
BV HUE	chodera	13				S2	chobiriwirira	5
	chobiriwira	8					chodera	5
							chakuda	5
							chobiriwira	4
BVB HUE	chobiriwira	9				S3	chotuwa	10
	chobiriwirira	4					chotuwira	7
	chodera	4						
B HUE	chobiriwira	14	T1	chobirirwira	10			
	chamtambo	6		chobiriwirira	6			
				chotuwa	6			
BGB HUE	chobiriwira	18	T3	chobiriwira	14			
	chamtambo	4		chamtambo	5			
BG HUE	chobiriwira	17	T1	chobiriwira	14	S2	chobiriwira	14
	chobiriwirira	6		chamtambo	6		chobiriwirira	3
							chodera	3
GBG HUE	chobiriwira	31				S2	chobiriwira	13
	chamasamba	2					chamtambo	5
							mtambo	5
G HUE	chobiriwira	28				S1	chobiriwira	19
	masamba	6					chobiriwirira	5
GYG HUE	chobiriwira	29	T4	chobiriwira	22	S1	chobiriwira	9
	chamasamba	4		chobiriwira-pang'ono	3		chotuwa	6
				chobiriwira-motuwa	3			
				chamasamba	3			
YG HUE	chobiriwira	31				S3	chobiriwira	8
	chamasamba	4					chakuda	4
YGY HUE	chobiriwira	26				S3	chobiriwira	8
	chamasamba	3					chobiriwirira	7
SIENNA	khofi	14	ROSE	chofiira	16	WHITE	choyera	37
	chofiirira	5		chofiirira	15			
GRAY-8	chakuda	28	GRAY-6	chakuda	12	GRAY-4	chotuwa	16
	chodera	6		chodera	10		chotuwira	5
GRAY-2	chotuwa	22	GRAY-1	chotuwa	19	BLACK	chakuda	34
	choyerera	4		choyera	7		chodera	2
	khaki	4						

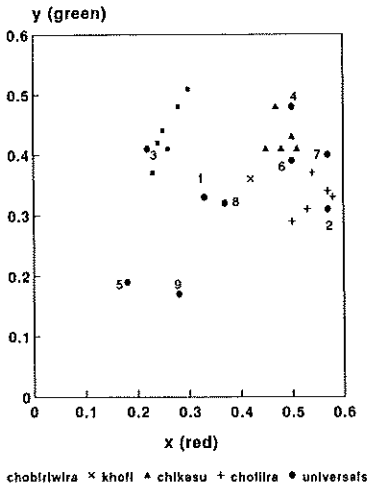

Fig. 3. Loci of tiles having a dominant term and of the universal foci. 1 = achromatic (white, black and grey), 2 = red, 3 = green, 4 = yellow, 5 = blue, 6 = brown, 7 = orange, 8 = pink, 9 = purple

A term can be the most frequent term for a tile even though a majority of people do not use it for that tile. For instance, the tile OYO HUE had *chofiiri* 'red' as the most frequent term, but only 15 informants applied the term to the tile (Table 3). Being the most frequent term is a necessary but not sufficient condition for the use of a term to show high consensus. We next give a stricter measure of consensus – the dominance index. We say a term is dominant for a given colour tile if half or more of the respondents give that name to the colour tile; the dominance index is then the total number of tiles for which a term is dominant. We give two versions of this index: the first is when the frequency for all forms of the term exeeds the criterion frequency; and the second is when the frequency for just the simple form of the term exceeds the criterion frequency (note that *chofiirira* 'reddish' was never dominant on its own). Thus for instance, in Table 3 the simple term *chikasu* 'yellow' is dominant for the tile Y HUE with a score of 39 out of a possible 40. Similarly, *chofiira* 'red' is dominant in its simple form for ORO HUE with a score of 31, but it does not achieve dominance in its simple form for the tile ORO T3 where it scores 18 out of a possible 40. However, the combined simple and attenuated forms – *chofiira* 'red' and *chofiirira* 'reddish' exceed the dominance criterion with a combined score of 27 out of a possible 40. For all terms except *choyera* 'white' and *chikasu* 'yellow' the scores reduce as we move from the number of colour tiles for which a term was most frequent, through the first dominance index, to the dominance index based on the simple form of the term.

Table 4
Summary of naming task. Frequencies, dominance indices and specificity indices for the twelve most frequent terms.

Term	Gloss	Simple form frequency	Attenuated form frequency	Total frequency	No. of tiles most frequent	Dominance index		Specificity index	
						Total form	Simple form	Total form	Simple form
		1	2	3	4	5	6	7	8
Chofiira	Red	288	272	658	19	18	5	0.86	0.53
Chakuda	Black	118	101	237	5	4	2	0.54	0.53
Choyera	White	43	19	68	1	1	1	0.59	0.86
Chobiriwira	Grue	382	83	567	21	13	6	0.57	0.44
Chikasu	Yellow	182	0	261	5	5	5	0.72	0.88
Chonwa	Grey	188	65	279	5	4	1	0.32	0.12
(Cha-)khofi	Cofee	98	26	164	4	1	1	0.12	0.20
Chamtambo	Blue	72	0	129	0	0	0		
Chamasamba	Green	43	0	80	0	0	0		
(Cha-)khaki	Khaki	15	0	19	0	0	0		
Chaphulsa	Ash Grey	15	0	55	0	0	0		
Chonwira	Darkish	30	0	30	0	0	0		

The loci of the tile colours for which a term was dominant according to the strictest criterion are shown in Fig. 3, as mentioned earlier. (The loci for *choyera* 'white', *chakuda* 'black' and *chotuwa* 'grey' all fall in the centre of the plot, in approximately the same place as the foci of the universal achromatic colours, designated by 1. The achromatic colours differ on Y [lightness]; thus if the colours were plotted in all three coordinates – Y, x, y – *chakuda* 'black' would score close to zero on Y; *choyera* 'white' would have the highest Y value of all and *chotuwa* 'grey' would have intermediate values on Y.) The loci of the foci of the 'universal' basic terms are also shown in Fig. 3, and it can be seen that the loci of the dominant terms fall close to the appropriate universal focus, spreading from the focus towards the centre of the plot (the universal foci are the most saturated exemplars of their respective categories; saturation increases with distance form the achromatic region designated by 1). For instance, *chikasu* 'yellow' has five dominant loci (designated by the large squares) which lie close to the universal yellow (designated by 4) but shifted towards the centre. The colours for which *chobiriwira* 'grue' is dominant fall predominantly in the green part of colour space (top left of the plot close to the universal focus of green designated by 3); respondents do use *chobiriwira* 'grue' to refer to the blue region as well, but although it is often the most frequent term for stimuli in this region, the scores do not achieve dominance. From Table 3 it can be found that this lack of dominance in the blue region arises because a significant minority of respondents use the term *chamtambo* 'blue' to name these colours. There are five tiles – B HUE, BGB HUE, BGB T3, BG T1 and GBG S2 for which *chamtambo* 'blue' is the second most frequent term after *chobiriwira* 'grue' (see Table 3). In fact, Table 3 under-represents the use of *chamtambo* 'blue' because we only give the two most frequent terms for each tile. If we take modified and combined forms of *chamtambo* 'blue' into account, then *chamtambo* 'blue' is a strong second to *chobiriwira* 'grue' for nine tiles in the blue region. The traditional term *chamasamba* 'green', although used a little, is rarely such a strong alternative term to *chobiriwira* 'grue': its highest score is six for G HUE.

We observed above that *chofiirira* 'reddish' was the only attenuated term to be the most frequent term for any tile. There are 13 tiles for which the combined forms of *chofiira* 'red' are dominant other than the five 'good' reds shown in Fig. 3 (towards the right of the plot close to the universal red designated by 2). These 13 tiles fall in the regions of colour space for which there is no established basic term in Chichewa. *Chofiirira* 'reddish' refers to pink, orange or purple regions; even so the simple form of *chofiira* 'red' is dominant for one colour in the orange region of colour space – O HUE – and is the most frequent term for a more yellow orange – OYO HUE. The single colour for which *(cha-)khofi* 'coffee' is dominant lies about midway between the universal brown (designated by 6) and the universal achromatic foci (designated by 1). The colour is a light brown (O SO in Table 3). Other colours in the brown region such as SIENNA, or R S3 (Table 3) have *(cha-)khofi* 'coffee' as the most frequent name, but without it achieving dominance.

The dominance indices we give in Table 4 capture part of consensus across speakers, but they are only partially independent of the overall frequency of use. They fail, for example, to capture the high degree of agreement over which stimuli are called

choyera 'white', even though its overall frequency is relatively low. Likewise, a term could achieve dominance through indiscriminate use. One measure which would capture the very specific use of a term is the specificity index. This is the ratio of dominant use to total use. That is, the total frequency with which a term was given summed across the tiles for which it was dominant, divided by the total use for that term; the index can take values from 0 to 1. A frequently used term could still have a low specificity index if there was little agreement as to which tiles it referred to; its distribution would be wide but thinly spread. On the other hand, a low frequency term could have a high specificity index, if, when it was used, there was high agreement as to which tile it denoted; its distribution would show local concentrations. We give two specificity indices in the final two columns of Table 4: the first is based on the dominance index for all the variants of a term, and the second is based on the dominance index for just the simple form of the term. Before describing the data we give an example of the calculation of the specificity index. For *chofiira* 'red', there were 153 instances of it being used in the simple form to name the five tiles for which it was dominant (referring to Table 3: O HUE 24 + ORO HUE 31 + RO HUE 35 + ROR HUE 35 + R HUE 28 = 153); the simple form was used 288 times in total (column 1 Table 4); thus the specificity index is 153/288 = 0.53.

On the total form specificity index (column 7) it can be seen that *chofiira* 'red' has the highest index (0.86) followed by *chikasu* 'yellow' (0.72); the next three terms – *choyera* 'white', *chakuda* 'black' and *chobiriwira* 'grue' – all have about the same score (0.5 to 0.6); and the last two terms have relatively low scores: *chotuwa* 'grey' (0.32); *(cha-)khofi* 'coffee' (0.12). The rank order changes somewhat on the index for the simple forms; the order is: *chikasu* 'yellow', *choyera* 'white', *chakuda* 'black' and *chofiira* 'red' with tied scores, *chobiriwira* 'grue', *(cha-)khofi* 'coffee' and *chotuwa* 'grey'. All other terms necessarily have zero specificity indices, as their dominance indices were zero.

Finally in this section, we summarise the main patterns in the data from the naming task. Recall that the naming task was used for two main purposes: first to try to establish which colour terms were basic, or at least to measure the degree of basicness of each colour term; and second, to map the regions of colour space denoted by each likely basic term. Of the measures we derive from the task, one set – naming frequencies – are additional measures of salience, and a second set – the dominance and specificity indices – are measures of consensus. By and large, using naming frequency as a measure of salience, supports the salience measure derived from the list task. There are some differences between the terms in their rank orders (most notably for *choyera* 'white', which has a low frequency score in Table 4) but in general the two measures of salience give similar results. The rank order in terms of the total frequency score from Table 4 is: *chofiira* 'red', *chobiriwira* 'grue', *chotuwa* 'grey', *chikasu* 'yellow', *chakuda* 'black', *(cha-)khofi* 'brown', *chamtambo* 'blue', *chamasamba* 'green' and *choyera* 'white'. It is likely that the basic terms are to be found in this set.

Turning to the measures of consensus, all of the terms just given, except *chamtambo* 'blue' and *chamasamba* 'green', have at least one tile for which they are the most frequent term, and also half or more of the sample use that term for at least one

tile (dominance indices greater than zero), although *(cha-)khofi* 'coffee' only just achieves the dominance criterion. The specificity indices reinforce the data from the dominance indices, the terms *chofiira* 'red', *chikasu* 'yellow', *choyera* 'white', *chobiriwira* 'grue' and *chakuda* 'black' have the five highest specificity indices, and the low index for *(cha-)khofi* 'coffee' suggests it has only a weak claim to basic status. The main strength of the specificity index is that it places *choyera* 'white' in its 'rightful' place amongst the highest scoring terms on the hierarchy, and *chotuwa* 'grey' and *(cha-)khofi* 'coffee' (if we treat it as the contender for the brown slot) towards the bottom of the hierarchy. These latter placements are in accord with the Berlin and Kay theory, whereas the relative rankings of the remaining terms match the rank order of the hierarchy only moderately: this is mainly due to the high scores for *chikasu* 'yellow', which outscores *chakuda* 'black' and *choyera* 'white' on the first measure and has the highest score of all on the second measure. Even so, the five highest scoring terms – *chofiira* 'red', *chikasu* 'yellow', *choyera* 'white, *chobiriwira* 'grue' and *chakuda* 'black' – form a legitimate five term combination according to Berlin and Kay.

3.3. Colour vision

Nine of the sample made at least one error on the test. Of those who made errors the mean number of errors was 2.3 and the most prevalent kind of error was the tritan error (yellow-blue). The scores indicate that about a quarter of the sample tested had 'mild tritanopia'. This is an unusual finding and one which is taken up in much greater detail in Davies et al. (1994). However, as there was no discernable difference between those with normal colour vision and those with mild tritanopia on any of our linguistic measures, we include the data from those with mild tritanopia in our totals and will not discuss the finding further here.

4. Discussion

Our data suggest that the five terms: *choyera* 'white, *chakuda* 'black', *chofiira* 'red', *chobiriwira* 'grue', *chikasu* 'yellow' are definitely basic. They were the five terms offered most frequently in the list task by both samples, and in addition they tended to be offered early in the lists. These same terms were, with one exception, also the most frequently used in the tile-naming task. The exception is *choyera* 'white', which was used relatively infrequently. But this is a direct consequence of colour contrast; to a first approximation, the brightest grey in a colour set will appear white and the next brightest grey will, in contrast, appear grey, even though on its own it may appear whit. Unless we included two or more identical whites in the set, the appearance of white will be limited to the single brightest colour tile, hence limiting the scope for the use of the white term.

In addition, the five contenders for the basic slots all have at least one colour tile for which the term is dominant and show high consensus of use, as indicated by the specificity indices. The achromatic terms have only one or two tiles for which they

are dominant, whereas *chofiira* 'red', *chobiriwira* 'grue' and *chikasu* 'yellow' have at least five tiles each for which they are dominant. In summary, all the measures converge to suggest that these five terms are basic.

There are two further terms vying for basic status: the first – *chotuwa* 'grey' – is a traditional term, whereas the second – *(cha-)khofi* 'coffee' – is an adaptation of the word for the beverage. Although the origin of *(cha-)khofi* 'coffee' suggests that its use might be restricted to a narrow range of objects, hence undermining its claim to basicness on Berlin and Kay's criteria, the way it was used on our tasks suggest that its use is not so restricted. In the naming task it was used to denote part of the region that would be called brown or its equivalent in languages with a clearly established brown term. However, the single tile for which it is dominant is some distance away from the focus of the universal brown (Fig. 3) although it is the most frequent term for four tiles that lie between the dominant locus and the universal locus. There is a lack of consensus over what to call tiles close to the universal focus: some informants include them in *chakuda* 'black', others include them in *chofiira* 'red' whilst a few include them in *(cha-)khofi* 'coffee'. Overall, though, the profile of results of *(cha-)khofi* 'coffee' suggest that it has not yet achieved basic status: it had relatively low scores on the list task – its frequency score was less than a third of the scores of the first five terms – and although it was used reasonably often on the naming task and achieved dominance for one tile, its use was thinly spread with only moderate agreement across respondents, as indicated by the low specificity scores. Thus Chichewa appears not to have a basic term for brown, though *(cha-)khofi* may become the basic term.

Chotuwa 'grey' has the next strongest case for being basic, after the first five terms: it is the sixth term on the list task, albeit with something of a step between it and the next highest term; its frequency on the naming task is higher than all terms except *chofiira* 'red' and *chobiriwira* 'grue'; there are five tiles for which it is the most frequent term, four tiles for which either *chotuwa* 'grey', *chotuwira* 'greyish' or one of the qualified forms is dominant, and one tile for which the simple form is dominant. But, it has low specificity indices, particularly for the simple form, reflecting low consensus, despite prevalent use. It is used mainly to denote light greys with the dark greys either falling under the domain of *chakuda* 'black' or, less commonly, *chonwira* 'darkish'. There is also another traditional term – *chaphulsa* – and a borrowed term – *chagre* – which compete for the grey region; they are much less prevalent than *chotuwa* 'grey', but even so, have the effect of reducing its scores on our measures. As with *(cha-)khofi*, it may be that *chotuwa* 'grey' is in transition, and it will gain further currency.

There are varying degrees of evidence in the data for three composite categories, or at least for their remnants. First, *chobiriwira* 'grue' denotes greens and blues, which suggests it might be a composite term. However, although it is the most frequently used term in the blue region, it fails to achieve dominance. We may be observing the early stages of its decomposition into separate green and blue terms. There is some suggestion in the students' data that the borrowed term *chabuluu* 'blue' together with the traditional term *chamtambo* 'blue (sky)' may be developing into 'twin' basic terms for blue, since over half the student informants offered one or

other term for blue. The blue terms were offered almost mutually exclusively: *chamtambo* 'blue' was offered ten times by the students and *chabuluu* 'blue' was offered fifteen times; but only one person offered both. However, nine students listed both *chobiriwira* 'grue' and *chamambo* 'blue', and ten gave both *chobiriwira* 'grue' and *chabuluu* 'blue'. This is consistent with the conjecture that the grue category may be decomposing, at least for groups like the students, by the development of a blue category, which suggests that *chobiriwira* might be left to denote green. This conjecture is supported by the fact that it was rare for *chobiriwira* to be offered either with the traditional term *chamasamba* 'green (leaf)' or the borrowed term *chagilini* 'green', which is consistent with their being alternative terms for green. The alternative terms for blue – *chabuluu* or *chamtambo* – were also used by the rural sample to some degree, to refer to the blue region in the naming task, whereas the focus of *chobiriwira* was in the green region. We found that a similar process of decomposition seemed to be happening to Xhosa (Davies and Corbett, forthcoming), but in that case the term for blue was generally the imported term *blue* rather than the traditional term *izulu* 'sky'.

A second possible remnant composite category involves *chakuda* 'black' and its attenuated form *chodera* 'blackish' (for which see fn. 2), which may be the remnant of a 'dark' category: it denotes colours extending into the dark greys. It is also used to denote some dark chromatic colours such as the blue-purples (V HUE and BV HUE) and the dark reds (RO S3 and RS3) although it is dominant only for RO S3, and that only when *chakuda* 'black' and *chodera* 'blackish' are taken together. The possible emergence of *chotuwa* 'grey' and *(cha-)khofi* 'coffee' or 'brown' as basic terms may be part of the process of the decomposition of the dark category.

Finally, *chofiira* 'red' may also be a remnant composite category. It is dominant for colours which in English would be orange (O HUE and OYO HUE), pink (e.g. Rose Red and ROR), purple (RV HUE) and pinkish-purple (RVR HUE). But it is clear that the focus of this category lies close to the universal red, and that the use of the attenuated form suggests some reservations about including the pinks, purples and oranges in the category.

In summary, Chichewa probably has five basic terms: *choyera* 'white', *chakuda* 'black', *chofiira* 'red', *chobiriwira* 'grue', and *chikasu* 'yellow'. Three of these – *chakuda* 'black', *chofiira* 'red' and *chobiriwira* 'grue' – look as though they have the characteristics of composite categories which may be in the process of decomposing. This inventory of basic colour terms is consistent with Berlin and Kay synchonically. Chichewa may be gaining two further basic colour terms: *chotuwa* 'grey' and *(cha-)khofi* 'coffee'; the latter term may become the basic term for brown. These changes seem to be happening at the same time as the decomposition of *chobiriwira*, rather than after it is complete. If so, this is inconsistent with Kay and McDaniel (1978), who proposed that brown should emerge only after separate green and blue terms had become basic. It will be interesting to continue to monitor these changes in Chichewa and in other languages of Africa.

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