1 **Aston & Hurlbert - What #theDress reveals about the role of illumination priors in colour**

2 **perception and colour constancy, Supplementary Material**

3 **Categorisation of colour names**

4 Table 1 shows the colour names that participants reported for the dress photograph the first time

5 they saw it and the categorisation of these colour names into original dress colour name groups. The

6 colour names reported by the participants were categorised independently by four members of the

7 Hurlbert Colour Vision Laboratories at Newcastle University. The categorisations of all four lab

8 members agreed.

9 *Table 1: Categorisation of the colour names that participants reported for the dress photograph the first time*

10 *they saw it. The original dress names column shows the colour names as reported by the participant. The*

11 *categorised column shows the categorisation of these colour names.*

Participant ID	Original Dress Names (Body/Lace)	Categorised (Body/Lace)
2000	white/gold	white/gold
2001	blue/black	blue/black
2002	blue/gold	blue/gold
2003	blue/black	blue/black
2005	blue/black	blue/black
2009	blue/black	blue/black
2021	white/gold	white/gold
2022	blue/(black/brown)	blue/black
2023	white/gold	white/gold
2024	white/gold	white/gold
2031	white/gold	white/gold
2033	blue/black	blue/black
2034	blue/black	blue/black
2039	blue/black	blue/black
2040	white/gold	white/gold
2041	blue/gold	blue/gold
2044	blue/gold	blue/gold
2045	blue/black	blue/black
2046	blue/black	blue/black
2047	white/gold (yellow)	white/gold
2049	blue/gold	blue/gold
2050	white/metallic gold	white/gold
2051	grey blue/gold	blue/gold
2052	light blue/chocolate brown	blue/gold
2053	blue/black	blue/black
2057	blue/black	blue/black
2059	blue/gold	blue/gold
2061	blue/gold	blue/gold
2062	white/gold	white/gold
2063	blue/black	blue/black
2064	white/gold	white/gold
2065	white/gold	white/gold

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13   Table 2 shows the colour names that participants reported for their matches to the dress body and

14   lace when presented in isolation. As with the original dress colour names, four members of the

15   laboratory independently categorised these data into groups. In 29 out of the 32 cases, all four

16   experimenters agreed. In two cases (participants 2050 and 2053), there was a 50/50 split in the

17   categorisation (2050: blue/gold vs. white/gold; 2053: blue/black vs. blue/white). Here, the

18   categorisation of the most experienced researcher was favoured. Similarly, for one participant

19   (2009) all categorisations disagreed (white/gold vs. blue/green vs. purple/green vs. blue/gold).

20   Again, the categorisation of the most experienced researcher was favoured.

21   *Table 2: Categorisation of the colour names that participants reported for their matches to the dress body and*

22   *lace when presented in isolation. The disk names column shows the colour names as reported by the*

23   *participant. The categorised column shows the categorisation of these colour names.*

Participant ID	Disk Names (Body/Lace)	Categorised (Body/Lace)
2000	lavender/bronze	purple/gold
2001	purpley blue/brown	blue/gold
2002	blue/gold	blue/gold
2003	sky blue/dark grey brown	blue/gold
2005	blue/black	blue/black
2009	light grey with tiny hint of blue and a breath of lilac/greeny mustard yellow ochre	white/gold
2021	lilac/fawn	purple/gold
2022	blue/brown	blue/gold
2023	very pale grey blue/dirty brown gold	blue/gold
2024	white/gold	white/gold
2031	blue/brown	blue/gold
2033	blue/black	blue/black
2034	pastel blue/reddy brown	blue/gold
2039	blue/green	blue/green
2040	pale blue/muddy yellow	blue/gold
2041	light blue/orangy brown	blue/gold
2044	blueish grey/sandy burnt yellow/gold	blue/gold
2045	duck egg/mustard	blue/gold
2046	lilac/khaki	purple/gold
2047	white/dark yellow	white/gold
2049	pale violet/fleshy tan	purple/gold
2050	grey bluey white/yellow	blue/gold
2051	grey blue/sandy orange	blue/gold
2052	light blue/dark orange	blue/gold
2053	blue/grey	blue/black
2057	blue/purple	blue/purple
2059	pale blue/mustard yellow	blue/gold
2061	light blue/gold	blue/gold
2062	blue/black	blue/black
2063	light grey/mustard	white/gold
2064	white/thorn	white/gold
2065	purple/mustard	purple/gold

24   **ANOVA analyses of dress body and lace colour matches**

25   With dress body matches grouped according to original dress colour names (B/K, W/G, B/G), there is

26   no difference across groups on the lightness (L^*) or blue-yellow (v^*) axes ($F(2,29) = 2.66, p =$

27   0.087 and $F(2,29) = 1.73, p = 0.196$). There was a difference along the red-green dimension (u^*:

28    $F(2,29) = 5.42, p = 0.01$), with the B/K group matching the dress body to significantly lower u^*

29   values (more green) than the W/G group (mean difference of 6.97, $p = 0.01$, Bonferroni corrected).

30   However, the same grouping for dress lace matches results in significant differences along all axes of

31   CIELUV colour space (L^*, u^* and v^*: $F(2,29) = 8.03, p = 0.002; F(2,29) = 13.21, p < 0.001$ and

32    $F(2,29) = 6.42, p = 0.005$).

33   With dress body matches grouped according to disk colour names (B/K, W/G, B/G, P/G) there are

34   significant differences along L^* ($F(3,26) = 6.32, p = 0.002$) and v^* ($F(3,26) = 7.56, p = 0.001$).

35   Matches did not vary along the u^* dimension ($F(3,26) = 2.47, p = 0.084$). Matches to the dress

36   lace also differ significantly between disk colour names groups on the v^* ($F(3,26) = 6.16, p =$

37   0.003) and u^* axes ($F(3,26) = 3.73, p = 0.024$). Dress lace matches did not differ across disk colour

38   name groups on the L^* axis ($F(3,26) = 2.41, p = 0.09$).

39   **Control experiment: achromatic matches at different luminance levels**

40   *Methods*

41   Seven participants from the main experiment returned to the laboratory at a later date to complete

42   a control experiment. The main purpose of the control experiment was to ascertain whether the

43   fixed luminance setting of the matching disk affects the chromaticity of the achromatic settings. In

44   particular, we asked if an increased luminance level leads to a bluer achromatic setting by requiring

45   that all participants adjusted the matching disk to look achromatic at each of five different fixed

46   luminance levels (7.35 cd/m^2 , 18.20 cd/m^2, 34.46 cd/m^2, 54.78 cd/m^2 and 96.49 cd/m^2;

47   equivalent to the minimum, lower quartile, median, upper quartile and maximum luminance

48   settings of the dress body matches from the main experiment and later referred to by their L^*

49   (lightness) value relative to the monitor white point: 23.93, 38.01, 50.83, 61.99, 78.19, respectively).

50   Participants repeated the adjustment three times at each luminance level. In addition, each

51   participant repeated their matches to the dress body and lace as well as completing three

52   illumination matches. All matching procedures followed the same protocol as the main experiment.

53   *Results*

54   CIELUV v^* values of the achromatic settings differed significantly across the different luminance

55   levels (Figure S1.A; Friedman test, $\chi^2(4) = 17.257, p = 0.002$). Achromatic settings became bluer

56   as luminance increased, with significantly lower v^* values at a luminance setting of 34.46 cd/m^2

57   ($L^* = 50.83$) compared to 7.35 cd/m^2 ($L^* = 23.93$) (mean difference of 2.739, $p = 0.024$, with a

58   Bonferroni correction). However, CIELUV u^* settings did not differ significantly (Figure S1.B;
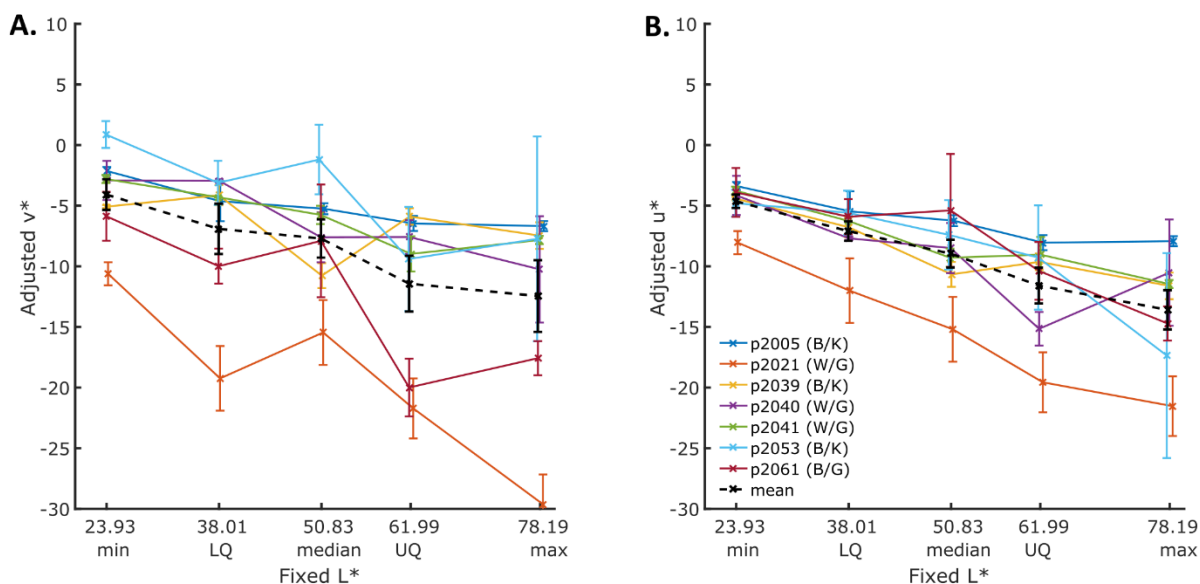
59   Friedman test, $\chi^2(4) = 3.886, p = 0.422$).

Figure S1. The chromaticity of the achromatic settings in the control experiment. A. CIELUV u* values of the achromatic settings across the different luminance levels, in L* units. B. CIELUV v* values of the achromatic settings across the different luminance levels. In both figures, each participant's matches are plotted separately (solid coloured lines) as well as the average over all participants (black dashed line). The legend shows which participants took part in the control experiment and whether they were categorised in the blue and black (B/K), white and gold (W/G) or blue and gold (B/G) orginal dress colour names groups.

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61   The matches that participants gave to the dress body and lace did not differ significantly from their

62   original matches along any dimension of CIELUV (Figures S2.A and S2.C; Wilcoxen Signed Ranks

63   Tests, $p > 0.128$ in all cases). Mean illumination matches also did not differ from original mean

64   illumination matches (Figures S2.B and S2.D; Wilcoxen Signed Ranks Tests, $p > 0.176$ in all cases).
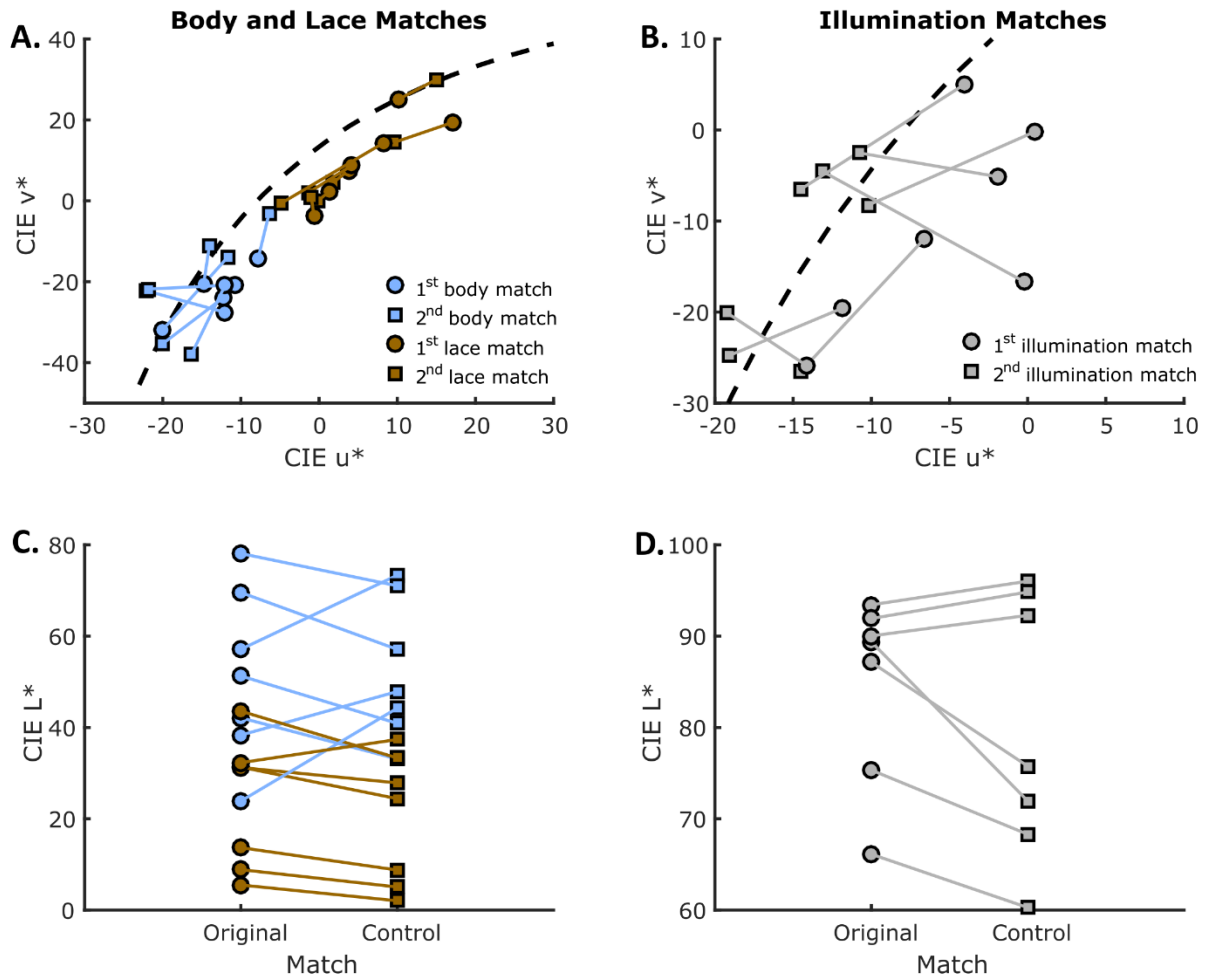
Figure S2. Matches to the dress body, dress lace, and illumination matches made during the control experiment. A. Original dress body (blue o) and lace (brown o) matches and those made during the control experiment (squares) plotted in the CIELUV chromaticity plane. B. Original illumination matches (o) and illumination matches made during the control experiment (squares) plotted in the CIELUV chromaticity plane. C. Original dress body (blue o) and lace (brown o) match luminance settings and the luminance settings of the matches made during the control expeirment (squares). D. Original illumination match luminance settings (o) and the luminance settings of matches made during the control experiment. In A and B, the black dahsed line represents the Planckian locus.

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