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RESEARCH ARTICLE

COLOR RESEARCH AND APPLICATION WILEY

Effects of team affiliation on color-valence associations

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Abstract

This study aims to empirically test whether identifying as a supporter of either New South Wales (NSW) or Queensland (QLD) rugby league teams influences the extent that their respective team colors blue and maroon are associated with positively and negatively valenced words. We used a valence categorization experiment and affective rating task (valence and preference) to investigate if team affiliation and shared ingroup experience influenced affective associations with team colors. NSW supporters were faster and more accurate when categorizing positive words presented in blue than maroon font and negative words in maroon than blue font. While QLD supporters did not significantly differ when categorizing words in either blue or maroon, they rated blue and maroon equally positively in contrast to the NSW supporters. Results from this study give us greater insights into how color-valence associations can be formed through subcultural ingroup affiliations.

KEYWORDS

color, color-emotion associations, emotion, subcultural effects, team affiliations

1 | INTRODUCTION

Colors have an impact on many different facets of our daily lives. Intriguingly, people develop both shared and idiosyncratic color preferences and color-valence associations.[1,2] The processes involved in developing these color preferences and associations are complex as they appear to involve multiple factors including biologically ingrained tendencies and socio-cultural learned experiences. As an example, red has both positive and negative connotations.[3–8] From a biological perspective, these connotations can be considered to be due to an evolutionary adaptation for avoiding danger associated with animals or foods with red colouration and interpreting red angry flushed faces as threatening (e.g., References [9,10]). In addition, red is thought to have implications for mate selection and attraction through red flushing faces indicating receptiveness to sex and romantic interest in heterosexual mating contexts.[11,12] Romance and love are also associated with red heart-shapes and roses in gift-giving. These findings highlight the role of context when perceiving and interacting with colors.[10] In particular, socio-cultural factors resulting from social learning have been suggested to be a factor in color-valence relationships.[9,13,14]

There is evidence to suggest that there are common or universal color-valence associations, which implies that there are shared and similar perceptions of colors as positive or negative.[5,15,16] For example, Jonauskaite et al.[5] found that participants from the UK, Germany, Greece, and China had relatively similar color-emotion associations for red associated with love and black having negative connotations. Similarly, in a world-wide study of color-emotion associations, Jonauskaite et al.[15] found

global similarities in endorsed color-emotion associations, for example, red associated with love and anger and black with sadness. However, culture-specific variations in color affective associations were also found, for example, yellow was considered to have positive connotations across UK, German, and Chinese participants but not for Greek participants.[5] Purple was found to be associated with sadness only in Greek participants and white with negative emotions in Chinese participants.[5,15] This indicates that there are common or universal connotations but also culture-specific variations in color-valence relationships.

Schloss et al.[14] have explored the effect of institution and sporting team color preferences through ecological valence theory (EVT). They posit that humans like or dislike colors in relation to the extent that they have positive or negative associations through personal experiences with these colored objects in their environments.[17] More recently, they have found that color preference and valence ratings are influenced by experiences, affiliations or membership with organizations and teams that are associated with specific colors. Support for political parties in the USA (Republican red or Democratic blue) and higher levels of "school spirit" or identification with college team colors (Stanford red and white or Berkley blue and gold) was found to correspond with an increase in valence judgments and preference for colors associated with these organizations.[14,18] A similar effect has been found to occur for identity with national colors in the context of international sport competitions.[19] Dutch participants showed higher rates of nationalism in the context of international football tournaments, which in turn were found to be related to more positive ratings of the national team color orange. Moreover, these color valence effects were found to be stronger when membership to these organizations were particularly salient, for example, during the election in the USA and during the European Soccer Championships.[18] Increased positive valence and color preference ratings in contexts where political parties and national sporting teams are salient suggests that organization and sport team affiliations play a role in forming specific color preferences and positive and negative valence associations. The relationship between positive valence and organization color appears particularly prevalent for sport team supporters as they are unified by their overall interest in a specific sport formed through personal allegiances and preferences for a specific team. They have shared in-group practices, experiences and behaviors and color preferences associated with their team colors and display membership to the ingroup by wearing jerseys/uniforms with their team's color.[14,19] Thus, it is likely that color preferences and associations are not only influenced by colored objects but colored entities that occur in subcultural ingroups including political parties and sporting teams.

Emotion categorization tasks can be used to empirically investigate color-valence relationships. In that task, the negative and positive affective words to be categorized are presented in different font colors to examine if categorization is facilitated or inhibited when presented in contrasting colors. These emotion categorization tasks using colored fonts are similar to a Stroop task but rely on the conceptual association being congruent with specific-colored fonts.[20] Facilitation effects of the color red have been found when categorizing anger-related words[21,22] and danger-related words (disease, peril, poison, emergency and threat).[23] Similarly, the color yellow has been found to be associated with joy-related words.[22] Emotion categorization tasks are an experimental paradigm that can be used as an implicit measure of whether processing positive and negative valence information is influenced by socially learned color associations from shared subcultural ingroup membership, behavior and experience.

In the current study, we empirically investigated color-valence relationships in supporters of the two Australian state teams from New South Wales (NSW) and Queensland (QLD), who compete annually in the State of Origin rugby league competition. They are colloquially known as the Blues (NSW) and Maroons (QLD) in line with the primary colors that each team wears. The State of Origin occurs in June–July and consists of a series of three matches. The current study was conducted during this period in 2022. We investigated shared team experience of color using a valence categorization task to implicitly measure whether there were differences in speed and accuracy when categorizing positive and negative words presented in team-colored fonts. The aim was to use the valence categorization task to experimentally investigate if identification with a shared subcultural ingroup corresponded with faster and more accurate responses to congruent team-color positive word pairs as this would suggest that supporter team color experience is a factor in color-valence relationships. By using a valence categorization task, we are extending previous research by Schloss et al.[14] and Lakens,[19] which primarily used self-rating scales as an explicit measure of color-valence associations. In the current study, we used a categorization task as an implicit measure of color valence associations to investigate if they occur automatically in a task where color is not task-relevant in the context of categorizing words by valence. Our design has also partially replicated the design of Schloss et al.[14] by including a color preference and valence rating task as an explicit measure of color valence associations. We can predict that presenting positive or negative words in specific

team colors will influence how quickly and accurately supporters categorize the words.

It is predicted that support for State of Origin rugby league teams will influence positive and negative associations of the team colors (NSW sky blue and QLD maroon). Specifically, individuals from NSW will have positive associations with blue and negative associations with maroon. On this basis, positive valence words will be categorized more quickly and accurately when presented in blue font and in turn, negative words categorized more quickly when presented in maroon font. Similarly, individuals from Queensland will have positive associations with maroon and negative associations with blue. Positive valence words will be categorized more quickly and accurately when presented in maroon font and negative words categorized more quickly and accurately when presented in blue font. Furthermore, team supporters will rate their team colors as more positive and preferred in comparison to the opposing team's colors.

2 | METHOD

2.1 | Participants

One hundred and four participants (35 male and 69 female) with a mean age of 39.9 years (SD = 15.6) were recruited for the online experiment. A priori G*Power (v3.1.9.2) analysis[24] revealed for repeated measures mixed-design analysis of variance (ANOVA) at an α-level of 0.05, power of 0.95 and medium effect size f of 0.25, 36 participants were required. This indicates the total sample size ($N = 104$) was sufficient for statistical analysis.

A link to the experiment was distributed to staff and students at Southern Cross University via email and through a post to the r/nrl community on Reddit (a website for people interested in the National Rugby League [NRL] competition). The experiment was run online due to data collection difficulties during the COVID-19 pandemic. All participants were asked to indicate that they had no known color vision deficiencies and supported either the NSW Blues ($n = 48$) or QLD Maroons ($n = 56$). Any participant who had color vision deficiencies or did not support a State of Origin team was removed from the experiment and thanked for their time. Supporters from NSW (30.8) and QLD (32.2) showed similar levels of support for their teams as measured by the Sport Spectator Identification Scale[25] ($p > 0.1$). Ethics was approved by Southern Cross University's Ethics Committee (Ethics approval number: 2021/024). All participants in this research were provided with an information sheet about the nature and requirements of this research and asked to complete a consent form prior to beginning the experiment.

2.2 | Materials and procedure

The sport spectator identification scale (SSIS),[25] emotion categorization experiment and color preference and affect rating survey were presented as an online study. It was custom-built using an online game engine with millisecond resolution (ensuring accuracy in response at the millisecond level) and hosted on the university's web platform. After the participant selected either NSW Blues or QLD Maroons fan membership, the screen displayed either a sky blue or maroon border while supporters responded to questions about demographic information and their level of support for their team. These distinctive colors served to prime the supporters of their respective teams. The participants then completed the sport spectator identification scale (SSIS)[25] that measured the level of support each participant had for either the NSW Blues or Queensland Maroons and further prime the participants to the context of the competition and their team. The SSIS consists of seven items which aim to measure the level of psychological connection fans have to their team. The seven items in the SSIS are answered by indicating a response from 1 to 7 on a Likert scale with 1 being "not at all important" and 7 being "very important. Each item of the SSIS followed the prompt "In the lead up to the State of Origin..." The SSIS's seven items were:

1. "How important to you is it that [named team] win?"
2. "How strongly do you see yourself as a fan of [named team]?"
3. "How strongly do your friends see you as a fan of [named team]?"
4. "During the season, how closely do you follow [named team] via any of the following: in person, by television, by radio, by televised news, or by newspaper?"
5. "How important is being a fan of [named team]?"
6. "How much do you dislike the greatest rivals of [named team]?"
7. "How often do you display [named team's] name or insignia at your place of work, where you live, or on your clothing?

Participants then completed the online valence categorization task, which was similar to Fetterman et al.[21] and Winskel et al.[22] Participants were tasked with categorizing affective words into the categories of positive or

TABLE 1 The lexical characteristics of the positive and negative words in terms of valence, arousal, dominance ratings and word length, HAL word frequency, and log frequency (retrieved from[26,27]).

Word type	Word	Valence	Arousal	Dominance	Word length	HAL frequency	HAL log frequency
Positive	Amazing	7.72	6.05	6.83	7	25 096	10.13
	Brilliant	7.5	5.95	7.16	9	7731	8.95
	Celebrate	7.84	6.73	6.12	9	3175	8.06
	Enjoy	7.67	5	7.28	5	46 729	10.75
	Happy	8.47	6.05	7.21	5	70 881	11.17
	Joyful	8.21	5.53	7.05	6	569	6.34
	Pleasant	7.24	2.91	6.7	8	6736	8.815
	Skilful	6.86	4.42	6.75	7	54	3.99
	Superb	7	4.33	6.64	6	3743	8.23
	Winner	7.86	6.53	7.42	6	11 890	9.38
	Mean	7.64	5.35	6.92	6.8	17 660.4	8.58
Negative	Awful	2.28	4.86	3.06	5	8797	9.08
	Dreadful	2.6	4.5	3.38	8	1353	7.21
	Hopeless	2.2	4.52	2.84	8	1974	7.59
	Horrible	2.33	5.95	5.16	8	8476	9.05
	Loser	2.85	3.94	4.53	5	4209	8.35
	Terrible	2.1	4.39	3.4	8	12 323	9.42
	Unhappy	1.84	5.1	3.71	7	3795	8.24
	Unpleasant	2.53	4.73	3.54	10	3053	8.02
	Useless	2.8	4.39	4.65	7	13 510	9.51
	Worthless	1.89	4.45	2.71	9	5546	8.62
	Mean	2.34	4.68	3.70	7.5	6303.6	8.51

negative. They were instructed to categorize the words as quickly and accurately as possible. Words were presented in three font colors. The font colors were sky blue (L: 76, C: 44, h: 236.4), maroon (L: 25, C: 41.9, h: 16.3), and a control black condition (L: 0, C: 0, h: 0). In color research, color calibration should be specified using device independent coordinates (e.g., CIE1931 xyY values), as this avoids the potential limitation of accuracy and replicability of colors across individual devices and monitors. The color coordinates reported here were recalculated from RGB coordinates (sky blue R: 0, G: 203, B: 254, maroon R: 114, G: 23,B: 44, black R: 0,G: 0,B: 0), which means the coordinates were initially recalculated from a device-dependent space which limits the consistency of color presentation across devices. However, similar to Schloss and Palmer,[18] the need to collect data from participants residing in two separate states during the covid pandemic necessitated data to be collected online. The State of Origin is a three-game series only played between June and July. Furthermore, individuals typically engage with their teams, NSW sky blues and QLD maroons, in a variety of contexts including team websites, news reports, watching games on tv/streaming, and on social media across a range of devices and monitors. This highlights that supporters would typically perceive these colors across a variety of devices and color conditions.

After receiving the instructions, an initial fixation point was presented for 500 ms prior to each affective word. The word appeared in size 30 font centered on the screen until either a response was made or 5000 ms had elapsed. Participants responded by either pressing the "X" key to categorize the word as negative or "M" key to categorize the word as positive. Ten words with positive valence (skilful, superb, pleasant, brilliant, amazing, enjoy, celebrate, winner, joyful, happy) and 10 words with negative valence (unhappy, worthless, terrible, hopeless, awful, horrible, unpleasant, dreadful, useless, loser) were selected. Lexical characteristics of the emotion words were accessed through the English Lexical Project (ELP[26]). Affective ratings were accessed from an inventory of word norms[27] (refer to Table 1). Independent samples *t*-tests showed that positive and negative words significantly differed on valence and dominance

(ps <0.001) but there was no difference in arousal, word length, or HAL frequency (all ps >0.1) Each of the color font word pairings was presented to participants three times. Participants responded to a total of 180 trials presented in a randomized order. Prior to beginning the experiment, participants were given 20 practice trials where they received feedback on the correctness of response. Participants were only able to continue if they correctly categorized 80% of responses.

2.3 | Color preference and valence rating survey

A color preference and valence rating survey, similar to Schloss et al.,[14] was presented at the end of the experiment. The survey was designed to compare participant color preference ratings and valence value attribution. Four color patches were presented that were the primary and secondary team colors for the NSW Blues (sky blue and navy blue) and QLD Maroons (maroon and gold). We conducted the color preference task based on Schloss et al.[14] by including eight other color patches (red, green, black, white, gray, yellow, orange, purple) (see Table 2) intended to disguise the purpose of the survey and colors of interest. Each participant was presented with 3 cm × 3 cm color squares in a random order and asked to rate the color by how much they liked/preferred it and how positive or negative it was perceived. The rating scale used a slider that participants could position anywhere from the far left to the far right which corresponded to values ranging from −100 to +100.

TABLE 2 Color hue coordinates of the colors used in the survey.

Color name	RGB coordinates
Red	255, 0, 0
Green	0, 255, 0
Gray	127, 127, 127
White	255, 255, 255
Black	0, 0, 0
Navy blue	0, 51, 153
Yellow	255, 255, 0
Maroon	114, 23, 44
Sky blue	0, 203, 254
Orange	237, 125, 49
Purple	112, 48, 160
Darker yellow/gold	255, 215, 0

3 | RESULTS

3.1 | RT analysis

A 2 (valence word: positive, negative) × 3 (font color: blue, maroon, black) × 2 (State team: NSW, QLD) ANOVA was conducted for participant response times. For the response time analysis, incorrect responses and response times that were 2.5 standard deviations above or below the participants' mean were removed 325 (3.8%) from NSW supporters and 259 (2.6%) from QLD supporters. Response times over 2.5 standard deviations of the mean are considered too slow to have sufficiently followed the instructions of the categorization task as they were tasked with categorizing valence words as quickly and accurately as possible.[20] See Goodhew, Dawel and Edwards[28] for a full discussion of response times and cut off scores for outliers.

A significant main effect for valence words was found, $F(1, 102) = 75.71$, $p < 0.001$, $\eta_p^2 = 0.426$ but no main effect for font color was found ($p > 0.6$). A significant interaction was found for font color x state team, $F(1, 102) = 5.00$, $p = 0.08$, $\eta_p^2 = 0.047$. NSW supporters responded to words in blue font (788 ms) significantly faster compared to words presented in maroon font (804 ms), $t(47) = -2.11$, $p = 0.04$, $d = -0.30$. There was no significant difference in categorization speed for NSW supporters when responding to words presented in black font (801 ms) compared to blue (788 ms) or maroon fonts (804 ms) ($ps > 0.07$). However, QLD supporters did not significantly differ in response speed for words presented in blue (802 ms) or maroon (794 ms), $t(55) = 1.29$, $p = 0.20$. Further, QLD supporters were not found to differ in response speed for black (785 ms) and maroon (794 ms) font, $t(55) = 0.81$, $p = 0.42$. However, QLD supporters were found to categorize words presented in a black font ($M = 785$ ms, SE = 16.12) significantly faster than words presented in a blue font ($M = 801$ ms, SE = 15.47), $t(55) = 2.75$, $p = 0.008$, $d = 0.37$. There was no significant difference in response speed between NSW (788 ms) and QLD (802 ms) supporters for words presented in blue font, $t(102) = -0.47$, $p = 0.64$. Furthermore, NSW supporters (804 ms) and QLD supporters (794 ms) did not significantly differ in response speed for words presented in maroon, $t(102) = 0.29$, $p = 0.77$. No significant difference was found between NSW and QLD supporters in response speed for words presented in black, $t(102) = 0.48$, $p = 0.63$. However, there was a significant emotion word × font color interaction, $F(1, 102) = 18.84$, $p < 0.001$, $\eta_p^2 = 0.156$. Positive words were categorized faster when presented in blue font ($M = 758$ ms, SE = 14.13) compared to maroon font ($M = 789$ ms, SE = 17.29), $t(103) = -2.94$, $p = 0.004$, $d = -0.29$ and

negative words were categorized faster when presented in maroon font ($M = 810$ ms, SE = 17.26) than blue font ($M = 838$ ms, SE = 16.80), $t(103) = 3.66$, $p < 0.001$, $d = 0.36$. Positive words were also categorized significantly faster when presented in blue font ($M = 758$ ms, SE = 14.19) compared to black font ($M = 787$ ms, SE = 16.54), $t(103) = -3.31$, $p = 0.001$, $d = -0.33$ and negative words were categorized more slowly when presented in blue ($M = 833$ ms, SE = 16.91) compared to black ($M = 798$ ms, SE = 16.22), $t(103) = 4.96$, $p = <0.001$, $d = 0.49$. Notably, a three-way interaction between emotion word × font color × state team was found, $F(1, 102) = 15.47$, $p < 0.001$, $\eta_p^2 = 0.132$ (refer to Figure 1).

In order to follow up the three-way interaction, ANOVAs were conducted separately for the NSW and Queensland team supporters. A 2 (valence word: positive, negative) × 3 (font color: blue, maroon, black) ANOVA was conducted for the NSW supporters. A significant interaction was found between valence word and font color, $F(1, 47) = 21.83$, $p < 0.001$, $\eta_p^2 = 0.317$. Post hoc analysis found that NSW supporters categorized positive words significantly faster when presented in blue font ($M = 732$ ms, SE = 24.29) compared to maroon font ($M = 806$ ms, SE = 32.03), $t(47) = -4.78$, $p < 0.001$, $d = -0.69$. In contrast, positive words were categorized significantly faster when presented in blue font ($M = 732$ ms, SE = 24.9) compared to black font ($M = 797$ ms, SE = 30.87), $t(47) = -4.61$, $p < 0.001$, $d = -0.67$. Furthermore, NSW supporters categorized negative words significantly slower when presented in blue font ($M = 850$ ms, SE = 30.12) compared to maroon font ($M = 802$ ms, SE = 30.25), $t(47) = 4.79$, $p < 0.001$, $d = 0.69$. Positive words were categorized more slowly by NSW supporters when presented in blue font ($M = 850$ ms, SE = 30.12) compared to black font ($M = 805$ ms, SE = 29.02), $t(47) = 3.16$, $p < 0.003$, $d = 0.46$.

A 2 (valence word: positive, negative) × 3 (font color: blue, maroon, black) ANOVA was conducted for the QLD supporters. There was no significant interaction effect for font color × valence word, $F(1, 55) = 2.46$, $p = 0.09$, $\eta_p^2 = 0.043$. No other significant differences were found (all $ps > 0.1$).

3.2 | Accuracy analysis

An aggregated score was created for the accuracy measure in SPSS which created an average response to each of the color and word combinations between 0 (incorrect) and 1 (correct). The resulting score between 0 and 1 was a measure of accuracy which is an average of how correct or incorrect the responses were to the color and valence word combinations. A 2 (State team: NSW, QLD) × 2 (valence word: positive, negative) × 3 (font color: blue, maroon, black) ANOVA was conducted on the accuracy of valence categorization. No significant main effect was found for valence word ($p > 0.05$). A significant main effect was found for font color, $F(1, 104) = 8.13$,

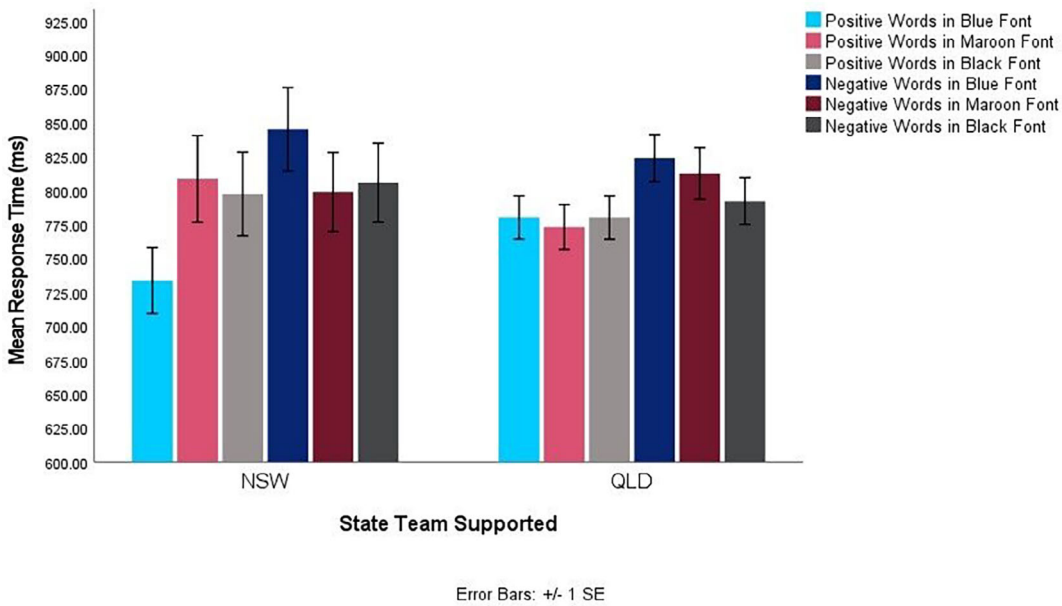

FIGURE 1 Response times (RT) of the NSW and QLD supporters to the emotion categorization task for positive and negative valence words in blue, maroon, and black font colors.

$p < 0.001$, $\eta_p^2 = 0.074$. A significant interaction was found for valence word x font color, $F(1, 104) = 18.28$, $p < 0.001$, $\eta_p^2 = 0.152$, and valence word × font color × state team supported, $F(1, 104) = 22.49$, $p < 0.001$, $\eta_p^2 = 0.181$ (see Figure 2).

To follow up the interaction effect, a 2 (valence word: positive, negative) × 3 (font color: blue, maroon, black) ANOVA was conducted on the response accuracy data for NSW and Queensland supporters separately. For the NSW supporters, a significant interaction was found for valence word x font color, $F(1, 47) = 27.72$, $p < 0.001$, $\eta_p^2 = 0.371$. Post hoc analysis found that NSW supporters categorized positive valence words more accurately when presented in blue font ($M = 0.99$, SE = 0.01) compared to maroon font ($M = 0.94$, SE = 0.01), $t(47)$, $= 4.71$, $p < 0.001$, $d = 0.68$. NSW supporters categorized positive words presented in blue font ($M = 0.99$, SE = 0.01) more accurately than positive words presented in black ($M = 0.97$, SE = 0.01), $t(47)$, $= 2.38$, $p = 0.02$, $d = 0.34$, and categorized positive words presented in black ($M = 0.97$, SE = 0.01) more accurately than maroon ($M = 0.94$, SE = 0.01), $t(47)$, $= -3.27$, $p = 0.002$, $d = 0.47$. Furthermore, NSW supporters categorized negative valence words more accurately when presented in maroon font ($M = 0.99$, SE = 0.004) compared to blue font ($M = 0.93$, SE = 0.009), $t(47) = -6.54$, $p < 0.001$, $d = -0.94$. NSW supporters also categorized negative valence words significantly more accurately when presented in black font ($M = 0.98$, SE = 0.004) compared to blue font ($M = 0.93$, SE = 0.009), $t(47) = -5.59$, $p < 0.001$, $d = -0.81$.

A 2 (valence word: positive, negative) × 3 (font color: blue, maroon, black) ANOVA was also conducted on the response accuracy data for QLD supporters. A significant interaction was found between color and valence, $F(1, 55) = 4.58$, $p = 0.01$, $\eta_p^2 = 0.077$. QLD supporters were found to categorize negative words more accurately when presented in black ($M = 0.98$, SE = 0.004) compared to maroon ($M = 0.95$, SE = 0.008), $t(55) = -2.88$, $p = 0.006$, $d = -0.39$, and compared to blue ($M = 0.95$, SE = 0.01), $t(55) = -2.42$, $p = 0.02$, $d = -0.32$. No other significant differences were found (all $ps > 0.09$).

3.3 | Color preference and affect ratings analysis

A series of independent samples t-tests were conducted to determine the difference in NSW and QLD supporter ratings of preference and affective valence for the colors sky blue and maroon. NSW supporters preferred sky blue ($M = 57.67$, SE = 6.10) significantly more than QLD supporters ($M = 33.62$, SE = 6.2), $t(101) = 2.76$, $p = 0.007$, $d = 0.55$. Furthermore, NSW supporters rated sky blue as more positive ($M = 55.46$, SE = 5.4) than QLD supporters ($M = 34.35$, SE = 5.89), $t(101) = 2.61$, $p = 0.01$, $d = 0.52$. QLD supporters preferred maroon ($M = 38.20$, SE = 5.60) more than NSW supporters ($M = -29.77$, SE = 7.29), $t(101) = -7.49$, $p < 0.001$, $d = -1.48$. In addition, QLD supporters rated maroon as more positive ($M = 30.51$, SE = 5.39) than NSW supporters ($M = -22.58$, SE = 5.45), $t(101) = -6.91$, $p < 0.001$,

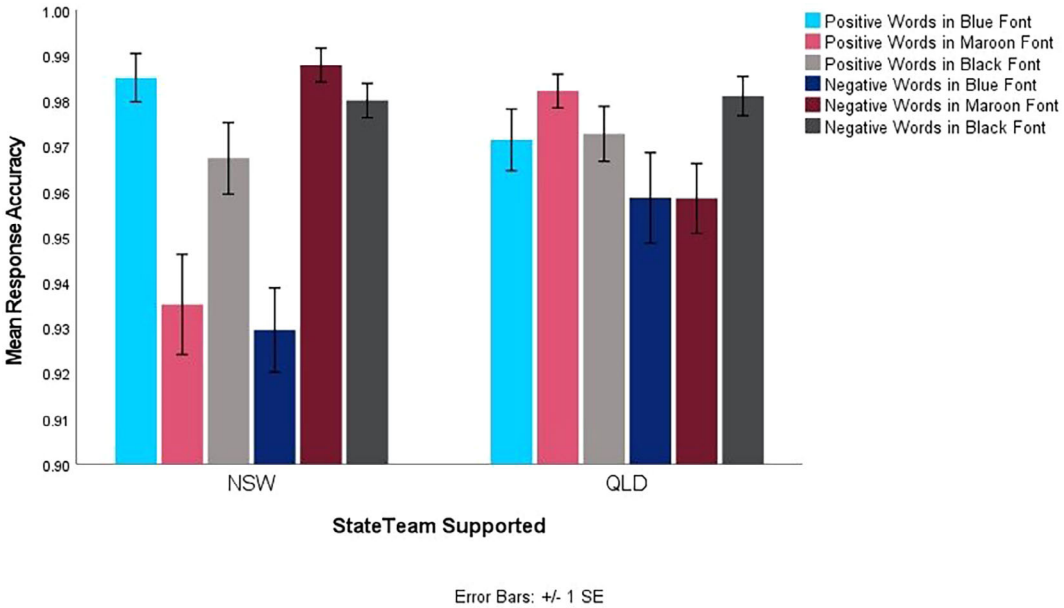

FIGURE 2 Response accuracy of NSW and QLD supporters in the emotion categorization task for positive and negative emotion words in blue, maroon, and black font colors.

$d = -1.36$. Independent samples t-tests for ratings for each of the other colors by NSW and QLD supporters were conducted (see Table 3). Orange was found to be preferred by QLD supporters ($M = 22.16$, $SE = 6.79$) compared to NSW supporters ($M = 1.63$, $SE = 7.39$) ($p = 0.04$, $d = -0.41$) (see Figure 3). Furthermore, QLD supporters had a stronger preference for black ($M = 13.44$, $SE = 4.82$) compared to NSW supporters ($M = -12.02$, $SE = 6.91$) ($p = 0.003$, $d = -0.61$), and rated black more positively (QLD $M = -8.8$, $SE = 3.93$, NSW $M = -25.92$, $SE = 6.39$) ($p = 0.03$, $d = -0.46$). They also showed a marginal preference for white. No other comparisons were found to be significant (all $ps > 0.1$).

4 | DISCUSSION

The study empirically investigated the relationship between identification as a supporter of a specific sport team, color-valence relationship, and preferences for team colors. This study extended the prior ratings-based studies conducted by Schloss et al.[14] and Lakens.[19] Color-valence relationships were investigated using a valence categorization task where participants gave a speeded response to positive and negative words presented in team colors, sky blue (NSW) and maroon (QLD). A secondary task assessed color valence and preference ratings similar to previous studies.[14,19] In line with EVT,[1] which suggests that experiences with color objects in an environment is a factor in preference and associations with colors and subcultural group effects on color Schloss et al.[14,18,19] it was predicted that participants with shared experience supporting either the NSW Blues team or QLD Maroons team in a rugby league competition would more quickly and accurately categorize positive words when presented in the font of their team color. We found qualified support for this prediction as NSW supporters categorized positively valenced words faster when presented in blue font and negatively valenced words faster when presented in maroon font. In line with this, NSW supporters were also found to more accurately categorize

TABLE 3 Mean color preference and affective valence ratings for NSW and QLD supporters.

Color rating	Team Supported, NSW	QLD	*p* Value
Black preference	−12.02	13.44	0.003**
Black affect rating	−25.92	−8.8	0.03*
Darker-yellow preference	7.60	10.67	0.77
Darker-yellow affect rating	46.00	36.16	0.24
Green preference	20.06	23.04	0.75
Green affective rating	41.33	36.49	0.54
Gray preference	−12.56	−9.11	0.70
Gray affective rating	−30.19	−19.8	0.13
Maroon preference	−29.77	38.20	<0.001***
Maroon affective rating	−22.58	30.51	<0.001***
Navy-blue preference	36.88	31.11	0.48
Navy-blue affective rating	31.71	25.18	0.38
Orange preference	1.63	22.16	0.04*
Orange affective rating	20.13	25.20	0.55
Purple preference	29.21	27.05	0.83
Purple affective rating	26.10	24.53	0.84
Red preference	10.92	24.47	0.17
Red affective rating	1.25	5.24	0.70
Sky-blue preference	57.67	33.62	0.007**
Sky-blue affective rating	55.46	34.35	0.01*
White preference	5.17	22.51	0.07
White affective rating	11.50	25.53	0.06
Yellow preference	16.58	16.29	0.98
Yellow affective rating	33.81	38.82	0.56

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

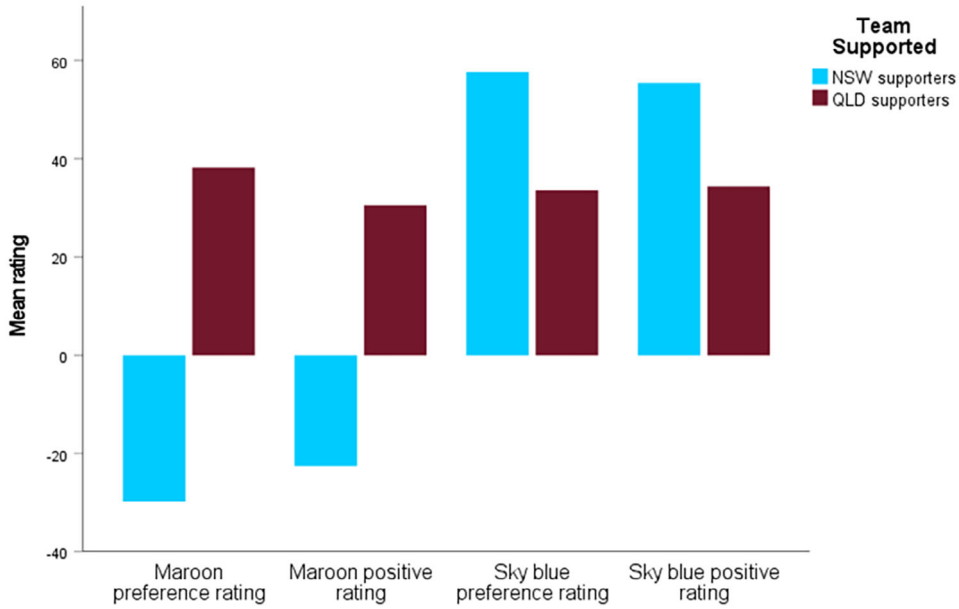

FIGURE 3 Mean color preference and affective ratings for the colors sky blue and maroon.

positive words presented in blue font compared to maroon font. Together these findings support previous research that indicates that identifying with a sporting team may form positive valence associations with the team's primary colors.[14,19] An implication from this is that color valence relationships are present not only in the context of culture or nationality but are also present in the context of shared experiences at a subcultural level.

For the QLD supporters, categorization speed and accuracy of positively valenced words in blue and maroon fonts were not found to be significantly different. There was also no difference in categorization speed or accuracy for negatively valenced words when presented in either blue or maroon fonts. However, the color preference and affective ratings task showed that QLD supporters rated maroon and blue as equally positive, which did not occur for the NSW supporters. This indicates that the QLD supporters have a relatively positive affective association with maroon that is comparable to sky blue.[6,29] As this positive association with maroon was only found in the QLD supporters, it suggests that affiliation with the team corresponds with the perception of the team color as positive. However, a predicted dislike or negative association with the opposing team colors was not found for QLD supporters when responding to sky blue. The color blue has previously been found to be the most popular color[13] and lightness in color such as occurs in sky blue is, in general, perceived in a more positive manner than darker colors as exemplified by the color maroon.[1,6,30] Considering that light blue colors typically have positive associations, the finding that QLD supporters displayed no differences in rating or responding to maroon and sky blue suggests that they have formed a positive association with maroon. This partially supports the predicted positive association with maroon for QLD supporters but suggests that team specific color associations may not always extend to forming negative associations with rival team colors.

For the color ratings survey, QLD supporters rated the colors orange and black as more positive than NSW supporters (see Table 3). The color preference for orange could be due to the QLD team's secondary team uniform color of gold and preference for black could be due to associations with the relatively dark maroon team color. These differences in color preferences and color valence ratings may indicate further state-based differences in formation of color associations. However, despite a notable difference in preference and valence between QLD and NSW supporters for the color black, there appeared to be little effect on the response time and accuracy of categorizing valence words presented in black font. It is likely that similar black-valence associations for QLD supporters were not found in the categorization task due to the prevalence of presenting text in a black font on white background may have resulted in black having a neutral valence in this context. Nevertheless, the differences in activation of black-valence associations between the categorization task and color rating task highlights the need—to use a variety of methodologies as color may have highly context-specific meanings or associations.

A potential limitation in the design is that the data was collected in an online study, and consequently, we did not have control over the color calibrations of the participants' screens. This may have influenced the results as maroon may appear more red or brown to

participants than intended. One way to address this would be to instruct all participants to set their screen to a specified brightness level and include a test of color labelling to see if colors are being perceived and interpreted consistently. Alternatively, a color naming task could be conducted at the end of the experiment to determine if participants have identified the colors correctly and named them similarly. However, there may not specifically be a need for this as the color terms sky blue and maroon were used consistently with a priming condition of the corresponding color in the experiment. This is likely to have informed the participants that the observed colors were sky blue and maroon. In addition, the color rating task where participants rated sky blue and maroon demonstrated the expected preference and valence ratings of their team colors indicating they are perceiving the team colors as sky blue and maroon.

Our design used the team supporter scale and team color background as a prime prior to the categorization task to activate the context of NSW or QLD team supporter. However, this may have introduced a potential confound as the color primes may have influenced the participants' response times and accuracy. The team supporter prime was introduced in our design due to previous color emotion and color valence research highlighting the role of the physical and psychological context a color is perceived in when activated specific color-valence associations.[9] Therefore, our design introduced the supporter survey prior to the experiment to prime participants with the context of being a supporter of their team. It is possible that our design has introduced a confounding variable by including the team color prior to the categorization task. In future studies a condition without the color prime could be included and the supporter scale could be included after completion of the experiment. Furthermore, the experiment could be conducted outside of the State of Origin competition time period to determine if the findings are consistent across the year. Future research could compare supporters and non-supporters from the same state in both the State of Origin season and offseason as this may provide further insight into the strength and duration of these color valence associations.

In conclusion, the current study empirically investigated whether supporter allegiance affects color-valence relationships. We found qualified support for this prediction as NSW fans were faster and more accurate when categorizing positive words presented in a blue font compared to maroon font and negative words in maroon font. However, we did not find the same level of team color-valence relationships in the QLD supporters. This may be due to the general preference for the color sky blue and lighter colors compared with the darker and less popular color maroon. Further research could investigate how preference for team color interacts with existing color valence associations such as lightness in hue and a general preference for some colors over others. The findings from this study give us greater insights into how color-valence associations may be related to subcultural in-group affiliations. Our study extends previous research by Schloss et al.[14] through a valence categorization task experiment that investigates the relationship between sporting team affiliations, color preference, and color valence associations. The valence categorization task indicates that these color valence associations may occur automatically in the context of making valence judgments of words where color is a task-irrelevant feature. Further, we have extended previous work by Schloss et al.[14] and Lakens[19] by using a valence categorization task to show that their findings for team supporter effects on color preference also occur in the context of color valence associations and in the context of Australian state rugby league team supporters. An implication of this is that specific positive or negative associations and emotion responses may be formed not only by experience with colored objects but through associating colors with organizations or teams that individuals identify with or encounter in their environment. The development of color preference and valence associations are complex as they may be influenced by multiple factors including social learning and personal experience through in-group affiliation and shared experiences.

AUTHOR CONTRIBUTIONS

Declan Forrester: Conceptualization, methodology, data collection, statistical analysis, writing – original draft. **Heather Winskel:** Methodology, statistical analysis, writing – review and editing, supervision. **Mitchell Longstaff:** Statisitical analysis support, writing – review and editing, supervision.

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CONFLICT OF INTEREST STATEMENT

The authors have no relevant financial or non-financial interests to disclose.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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