

ORIGINAL RESEARCH ARTICLE

Consumer Hedonic Evaluation of Beef Steak Doneness: Color, Texture, and Taste Preferences at a Casual Dining Restaurant in Purwokerto, Indonesia

Alifah Lisy Syafa'at^{1,a}, Tri Sukmaningsih^{1*}, Fani Dwi Evadewi¹

¹ Faculty of Animal Science, Universitas Wijayakusuma Purwokerto, Purwokerto, Central Java, Indonesia

^a Undergraduate student, Animal Science Study Program (S1), Faculty of Animal Science, Universitas Wijayakusuma Purwokerto

*Corresponding author: trisukmaningsih@unwiku.ac.id

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ABSTRACT

Beef steak doneness shapes the color, texture, and taste consumers experience at the table, yet little evidence of sensory preferences exists from Indonesian foodservice settings. This study evaluated consumers' hedonic perceptions of beef steak doneness and its associated color, texture, and taste attributes among patrons of the Sunday Barbecue restaurant in Purwokerto, Central Java, Indonesia. Data were collected between 28 June and 6 July 2025 from 40 untrained consumer panelists selected through random sampling and interviewed using a structured questionnaire based on a five-point Likert-type hedonic scale, following a descriptive survey design. Medium doneness was the most preferred level (37.5%, $n = 15$), followed by well done (25.0%, $n = 10$), medium rare (22.5%, $n = 9$), and medium well (15.0%, $n = 6$); no respondent selected rare (0%). For the associated sensory attributes, reddish-brown color (merah kecoklatan) was preferred by 55.0% of respondents (weighted score 149 of a possible 200), moderately chewy texture (cukup kenyal) by 45.0% (weighted score 136), and a very tasty flavor (sangat enak) by 42.5% (weighted score 163). Most respondents were female (55.0%), aged 18–24 years (67.5%), and visiting the restaurant for the first time (57.5%). Taste received the highest weighted hedonic score among the three sensory attributes, followed by color and then texture, indicating that flavor is the primary driver of steak acceptability at this restaurant, while the preferred reddish-brown color and moderately chewy texture converge with the medium doneness level, at which surface browning from the Maillard reaction coexists with a moist, pink interior. These findings provide restaurant operators with an evidence base for cooking-standard operating procedures, staff training, and menu communication targeted at the dominant medium-doneness preference.

Keywords: *beef steak; consumer preference; degree of doneness; hedonic test; sensory evaluation*

INTRODUCTION

Beef occupies a central place in Indonesian animal-protein consumption even though per-capita intake remains modest by regional standards, at roughly 1.6 to 2 kilograms per year compared with 5 to 7 kilograms in neighboring Thailand and Vietnam (6Wresearch, 2021; Statista/OECD, 2025). Rising disposable income, urbanization, and the expansion of casual and fine-dining foodservice outlets have nonetheless pushed beef further into everyday consumption, with beef contributing close to 14% of per-capita meat intake in Indonesia, the highest share recorded in Southeast Asia (Meat & Livestock Australia, 2025). Among beef preparations, steak has grown from a specialty Western dish into a widely available restaurant staple across Indonesian cities, reflecting a broader global pattern in which foodservice quality, rather than raw-meat purchasing alone, increasingly mediates consumer satisfaction with beef (Zanetta et al., 2024).

A defining attribute of steak is its degree of doneness, conventionally classified from rare to well-done according to internal cooking temperature and the corresponding changes in color, juiciness, and texture (USDA Food Safety and Inspection Service, 2022). Doneness is not merely a food-safety parameter; it is also the strongest single determinant of the sensory experience consumers associate with a steak, because cooking temperature governs the extent of myoglobin denaturation and surface Maillard browning that together define visual color, and the degree of protein coagulation that defines chewiness and juiciness (Ruedt, Gibis, & Weiss, 2023; Nishinari & Fang, 2018). Preferred doneness levels differ markedly across populations: United States consumers have historically favored medium-rare to medium doneness, whereas survey and consumer-panel evidence from Turkey indicates a majority preference for well-done and very well-done beef, and marbling level does not eliminate this cross-country divergence (Benli & Yildiz, 2023; Prill et al., 2019). This variability suggests that local culinary habits and dining contexts shape

doneness preference, and that generalizing findings from one market to another, including Indonesia, is unreliable without local sensory-preference evidence.

Among the intrinsic quality cues that consumers use to judge cooked beef, color is often the first and most influential, because the reddish to brown gradient on a steak's surface signals doneness before the first bite, driven by the sequential oxidation of oxymyoglobin to metmyoglobin and by non-enzymatic browning at the meat surface once temperatures exceed approximately 140–150°C (Ruedt, Gibis, & Weiss, 2023; Malheiros et al., 2025). Texture, closely tied to tenderness and chewiness, is shaped by muscle fiber structure, connective tissue, and the degree of protein denaturation during cooking, and it remains one of the most heavily weighted attributes in meat-product evaluation because it is registered continuously throughout mastication rather than at a single moment of tasting (Nishinari & Fang, 2018). Taste and overall flavor liking, in turn, have been repeatedly identified as the strongest drivers of consumer acceptance once a minimum tenderness threshold is met, outweighing even visual cues once the steak is actually consumed (Miller, 2020; Garmyn, 2020). Because color, texture, and taste interact with doneness in cuisine- and country-specific ways, understanding how a given consumer population evaluates these three attributes alongside doneness preferences offers actionable guidance for restaurant standard operating procedures, staff training, and menu communication (Zanetta et al., 2024).

Sunday Barbecue, a casual dining restaurant established in 2021 in Purwokerto, Central Java, serves steak alongside smoked beef specialties and represents a growing category of mid-market steakhouses in provincial Indonesian cities. Despite this growth, sensory-preference studies of beef doneness in Indonesian foodservice settings remain scarce, and restaurant operators in this segment generally rely on informal, unverified assumptions about customer preference rather than systematic hedonic data. This study therefore applied a consumer hedonic test, following the descriptive survey approach commonly used in restaurant and meat-consumer research (Rahi, 2017; Ogundijo, Tas, & Onarinde, 2022), to determine (1) consumer preference for

beef steak degree of doneness, and (2) the associated hedonic evaluation of steak color, texture, and taste, together with the demographic profile of respondents, among patrons of Sunday Barbecue restaurant, Purwokerto, Indonesia.

MATERIALS AND METHODS

Time and location

The study was conducted over a nine-day period, from 28 June to 6 July 2025, at Sunday Barbecue restaurant, located on Jalan Flamboyan, Glempang, Bancarkembar, North Purwokerto District, Banyumas Regency, Central Java, Indonesia. Sunday Barbecue is a casual dining restaurant established in 2021 that offers a steak-focused menu, along with smoked brisket and smoked short-plate specialties.

Respondents and sampling procedure

The study population consisted of adult patrons of Sunday Barbecue restaurant. We selected 40 untrained consumer panelists using a random sampling procedure, consistent with intercept-survey designs used in prior restaurant and meat-consumer research, in which customers complete questionnaires during their visits (Benli & Yildiz, 2023; Rahi, 2017). Researchers approached respondents individually inside the restaurant and asked them to complete a structured, self-administered questionnaire after consuming their ordered steak. Prior beef doneness-preference studies have used untrained consumer panels of comparable or smaller size to represent everyday restaurant patrons rather than sensory experts (Benli & Yildiz, 2023).

Measured variables and hedonic scale

Two categories of variables were recorded. The first was respondents' preferred degree of doneness, classified into five levels following standard steak-doneness terminology: rare, medium-rare, medium, medium-well, and well-done. The second was a hedonic evaluation of the steak actually served, covering three sensory attributes: color, texture, and taste. Each attribute was rated using a five-point Likert-type hedonic scale (Addo-Preko, Amissah, & Adjei, 2023), with descriptive anchors specific to each attribute as summarized in Table 1.

Table 1. Descriptive anchors of the five-point hedonic scale used for the color, texture, and taste attributes of beef steak.

Score	Color	Texture	Taste	Score	Color
1	Pale red	Not chewy	Not tasty	1	Pale red

Score	Color	Texture	Taste	Score	Color
2	Fairly red	Slightly chewy	Slightly tasty	2	Fairly red
3	Red	Moderately chewy	Moderately tasty	3	Red

We treated individual doneness preference and the color, texture, and taste ratings as independent single-item indicators. For each indicator, we calculated a weighted score by summing, across all 40 respondents, the product of response frequency and Likert score for each scale point, yielding a possible range from 40 (all respondents selecting the lowest scale point) to 200 (all respondents selecting the highest scale point). This weighted-score range was divided into five equal class intervals of 32 points, following the continuum-line procedure commonly used to translate Likert-based hedonic scores into descriptive categories in consumer surveys (Addo-Preko, Amissah, & Adjei, 2023): very low/dislike (40–71), low/dislike (72–103), moderate (104–135), high/like (136–167), and very high/like (168–200).

Respondent characteristics

In addition to the sensory evaluation, respondents' demographic profile was recorded, comprising gender, age group, educational

attainment, occupation, and frequency of visits to the restaurant, consistent with sociodemographic variables commonly evaluated alongside food-choice and restaurant-satisfaction outcomes (Ogundijo, Tas, & Onarinde, 2022; Spinelli et al., 2020; Zanetta et al., 2024).

Data analysis

Data were analyzed descriptively. Response frequencies were converted to percentages of the total sample ($n = 40$), and weighted hedonic scores were calculated and categorized as described above, following the descriptive survey-analysis approach applied in prior consumer and sensory-preference research (Rahi, 2017; Addo-Preko, Amissah, & Adjei, 2023). No inferential statistical tests were applied, consistent with the study's descriptive, single-restaurant hedonic-survey scope.

RESULTS AND DISCUSSION

Consumer preference for beef steak degree of doneness

Table 2. Consumer preference for beef steak degree of doneness ($n = 40$).

Degree of doneness	Frequency	Percentage (%)	Weighted score	Degree of doneness
Rare	0	0.0	0	Rare
Medium rare	9	22.5	18	Medium rare
Medium	15	37.5	45	Medium
Medium well	6	15.0	24	Medium well
Well done	10	25.0	50	Well done
Total	40	100.0	137	Total

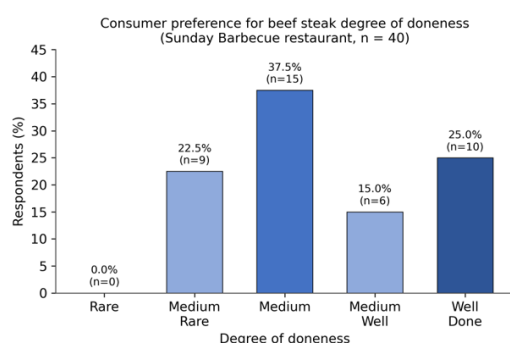


Figure 1. Distribution of consumer preference for beef steak degree of doneness at Sunday Barbecue restaurant ($n = 40$).

Medium doneness was the most preferred level, selected by 37.5% of respondents ($n = 15$), followed by well done (25.0%, $n = 10$), medium

rare (22.5%, $n = 9$), and medium well (15.0%, $n = 6$); no respondent selected rare (0%). The corresponding weighted score for the doneness indicator was 137 out of a possible 200, placing overall doneness preference in the high category on the continuum scale used in this study. The concentration of preference at medium and well done, together totaling 62.5% of respondents, differs from the pattern typically reported for United States consumers, among whom medium rare and medium are more evenly favored, but resembles findings from Turkey, where a majority of surveyed and panel-tested consumers preferred well done or very well-done beef (Benli & Yildiz, 2023). This convergence with the Turkish pattern, rather than the North American one, suggests that doneness preference in this

Indonesian restaurant sample leans toward more thoroughly cooked beef, plausibly reflecting local culinary conventions and food-safety expectations rather than a universal palatability optimum, since visual and instrumental evidence indicates that overcooking beyond medium typically reduces tenderness and juiciness regardless of the population studied (Prill et al., 2019; Drey et al., 2019).

The complete absence of a rare preference aligns with broader evidence that Asian consumer

markets tend to avoid visibly undercooked beef, associating a pink or red interior with food-safety risk rather than premium eating quality (Benli & Yildiz, 2023; Seko et al., 2020). Restaurants serving predominantly local, non-expert diners may therefore benefit from defaulting new customers to medium doneness rather than offering rare as a standard option, while retaining well-done for the sizeable minority of consumers who explicitly prefer a fully cooked steak.

Color preference

Table 3. Consumer hedonic evaluation of beef steak color (n = 40).

Color category	Frequency	Percentage (%)	Weighted score	Color category
Pale red	1	2.5	1	Pale red
Fairly red	3	7.5	6	Fairly red
Red	8	20.0	24	Red
Reddish-brown	22	55.0	88	Reddish-brown
Brown	6	15.0	30	Brown
Total	40	100.0	149	Total

Reddish-brown was the most preferred steak color, selected by 55.0% of respondents (n = 22), with a weighted score of 149 out of 200, corresponding to the high/like category. Pale red, the color associated with the least-cooked steaks, was the least preferred (2.5%, n = 1). A reddish-brown steak surface typically indicates that the exterior has undergone sufficient Maillard browning while the myoglobin pigment beneath the crust remains only partially oxidized, a color signature most closely associated with medium doneness (Ruedt, Gibis, & Weiss, 2023). The convergence between the modal color preference and the

modal doneness preference reported above is therefore internally consistent: respondents who prefer medium doneness are, by the underlying meat chemistry, also selecting the reddish-brown color profile associated with medium doneness. This finding aligns with evidence that color serves as a primary quality cue at the purchase and consumption stages for beef, shaping expectations of freshness, doneness, and overall eating quality even before texture or taste are assessed (Malheiros et al., 2025; Motoyama, Sasaki, & Watanabe, 2016).

Texture preference

Table 4. Consumer hedonic evaluation of beef steak texture (n = 40).

Texture category	Frequency	Percentage (%)	Weighted score	Texture category
Not chewy	1	2.5	1	Not chewy
Slightly chewy	4	10.0	8	Slightly chewy
Moderately chewy	18	45.0	54	Moderately chewy
Chewy	12	30.0	48	Chewy
Very chewy	5	12.5	25	Very chewy
Total	40	100.0	136	Total

A moderately chewy texture was preferred by 45.0% of respondents (n = 18), the largest share among the five texture categories, with a weighted score of 136 out of 200, at the boundary between the moderate and high/like categories. Respondents avoided both extremes: a texture that was neither chewy (2.5%) nor very chewy (12.5%) was less preferred than an intermediate chewiness that retained a clear muscle-fiber structure while remaining easy to bite through. This pattern is consistent with sensory science evidence that

meat texture is evaluated dynamically throughout mastication rather than at a single point of contact, and that consumers generally favor a balance between structural integrity and ease of breakdown rather than either extreme (Nishinari & Fang, 2018). Texture received the lowest weighted score among the three sensory attributes evaluated in this study, suggesting that, within the range of doneness levels served at Sunday Barbecue, texture differentiated consumer opinion less sharply than color or taste, plausibly because moderate chewiness is

achievable across a fairly wide band of internal cooking temperatures around medium doneness.

Taste preference

Table 5. Consumer hedonic evaluation of beef steak taste (n = 40).

Taste category	Frequency	Percentage (%)	Weighted score	Taste category
Not tasty	0	0.0	0	Not tasty
Slightly tasty	0	0.0	0	Slightly tasty
Moderately tasty	14	35.0	42	Moderately tasty
Tasty	9	22.5	36	Tasty
Very tasty	17	42.5	85	Very tasty
Total	40	100.0	163	Total

Taste received the most favorable evaluation among the three sensory attributes: 42.5% of respondents (n = 17) rated the steak as very tasty, and no respondent selected the two least favorable categories (not tasty or slightly tasty), yielding a weighted score of 163 out of 200, the highest of the three attributes and well within the very high/like category. This result aligns with the broader meat science literature, which indicates that once a minimum tenderness threshold is met, flavor becomes the dominant driver of overall eating satisfaction and is frequently cited by consumers as the single most important attribute of a positive beef-eating experience (Miller, 2020; Garmyn, 2020). Because taste outscored both color and texture in this study, restaurant quality-control efforts to maintain consistent seasoning, marination, and cooking technique may have a proportionally greater impact on overall consumer satisfaction than efforts focused solely on visual presentation.

Figure 2. Total weighted hedonic scores for color, texture, and taste attributes of beef steak (n = 40; possible range 40–200).

Comparing the three attributes directly, the ranking taste (163) > color (149) > texture (136) indicates that flavor was the strongest, and texture the weakest, differentiator of consumer liking in this sample. This ordering mirrors findings from broader beef-palatability research showing that flavor liking tends to carry more weight in overall satisfaction once tenderness is judged acceptable, while highly visible cues such as color still shape first impressions and purchase-stage expectations even though their influence on post-consumption liking is somewhat smaller (Miller, 2020; Ruedt, Gibis, & Weiss, 2023). For Sunday Barbecue and comparable Indonesian casual-dining steakhouses, these results suggest prioritizing recipe and seasoning consistency alongside doneness control, since taste provided the clearest and most unanimous basis for consumer approval among the attributes examined.

Respondent characteristics

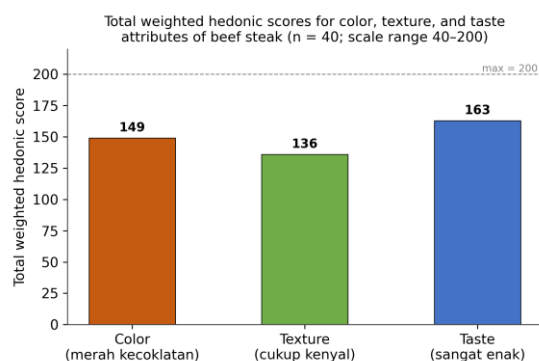


Figure 2. Total weighted hedonic scores for color, texture, and taste attributes of beef steak (n = 40; possible range 40–200).

Table 6. Sociodemographic characteristics of respondents (n = 40).

Variable	Category	Frequency	Percentage (%)
Gender	Female	22	55.0
	Male	18	45.0
Age	< 18 years	1	2.5
	18–24 years	27	67.5
	25–34 years	6	15.0
	35–44 years	5	12.5
	45–54 years	0	0.0
	> 54 years	1	2.5
Education	Junior high school or below	2	5.0
	Senior high school	22	55.0
	Diploma	1	2.5
	Bachelor's degree	13	32.5
	Master's degree	2	5.0
Occupation	Student	18	45.0
	Civil servant	4	10.0
	Self-employed	5	12.5
	Private employee	12	30.0
	Other (e.g., lecturer)	1	2.5
Visit frequency	First visit	23	57.5
	2–3 visits	4	10.0
	4–6 visits	4	10.0
	More than 6 visits	9	22.5

The respondent sample was slightly female-majority (55.0% female, 45.0% male), a pattern consistent with evidence that women are frequently over-represented in voluntary restaurant-based consumer surveys, although gender itself has been shown to influence fat-rich meat choice and eating-behavior dimensions more strongly than it influences overall dining-out frequency (Spinelli et al., 2020). Most respondents (67.5%) were between 18 and 24 years old, reflecting the demographic profile typical of casual dining restaurants located near university areas; this concentration is noteworthy because age, more than other sociodemographic variables such as education or gender, has been identified as a significant determinant of food-choice and purchasing-behavior patterns in consumer research (Ogundijo, Tas, & Onarinde, 2022). Educational attainment was moderate, with senior-high-school graduates (55.0%) and bachelor's-degree holders (32.5%) together accounting for most respondents, and students were the

largest occupational group (45.0%), consistent with the young-adult age profile. More than half of respondents (57.5%) were visiting Sunday Barbecue for the first time, while 22.5% had visited more than six times, indicating a customer base that combines new-customer acquisition with a smaller core of repeat patrons; restaurant-satisfaction research emphasizes that food quality, including consistent doneness and flavor delivery of exactly the kind measured in this study, is the single strongest predictor of the revisit intentions needed to convert first-time visitors into repeat customers (Zanetta et al., 2024).

CONCLUSION

Consumers at Sunday Barbecue restaurant in Purwokerto, Indonesia, most preferred beef steak cooked to medium doneness (37.5%), followed by well-done (25.0%), with no respondents preferring rare doneness. This doneness preference converged with a preference for reddish-brown steak color (55.0%; weighted score 149 of 200) and moderately chewy texture (45.0%; weighted

score 136 of 200), both sensory outcomes consistent with medium-doneness cooking chemistry. Taste received the most favorable evaluation among the three sensory attributes, with 42.5% of respondents rating the steak as very tasty (weighted score of 163 out of 200), indicating that flavor was the strongest driver of consumer liking in this sample, ahead of color and texture. The respondent base was predominantly young adults (67.5% aged 18–24), slightly female-majority (55.0%), and largely first-time visitors (57.5%). These findings offer restaurant operators an evidence-based target for cooking standard operating procedures, staff training on doneness communication, and recipe or seasoning consistency, centered on a medium-doneness, reddish-brown, moderately chewy, and well-flavored steak profile. As this study was descriptive and confined to a single restaurant and a 40-respondent convenience-timed sample, future research should extend the hedonic evaluation to multiple restaurants and cooking methods, incorporate trained-panel instrumental measures of color, texture, and doneness alongside consumer hedonic scores, and test whether the preference pattern observed here generalizes across other Indonesian cities and dining formats.

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Author contributions

A.L.S.: conceptualization, methodology, investigation, data curation, and writing of the original draft. S.H. and T.S.: supervision, methodology, validation, and writing review and editing. F.D.E.: supervision, formal analysis, and writing review and editing. All authors read and approved the final manuscript.

Ethics statement

This study did not involve live-animal experimentation; only cow's milk as a food raw material was used, and no ethical approval was required.

Conflict of interest

The authors declare no conflict of interest.

Data availability statement

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

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