**ORIGINAL ARTICLE**

# Taxonomy for the assessment of the subjective experience of curly hair manageability

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## Abstract

**Objectives:** This paper aims to develop and validate a taxonomy for the assessment of the subjective experience of curly hair manageability. It represents the latter of two iterative stages of a mixed-method design interdisciplinary project.

**Methods:** The qualitative stage of the study incorporated thematic analysis of 14 interview transcripts generated using a video-ethnographic method (SEBE). A survey-based instrument assessing different elements of the construct of hair manageability designed during the first stage of this project was further developed following consultations with experts with extensive experience in hair research, product development, testing and trichology. The instrument was tested online with 506 female participants self-reporting natural curly hair, types 3A and higher according to the Andre Walker Curl Classification.

**Results:** The initial construct of four groups of hair goals received positive content validity from the experts. High scale reliability was achieved for the aesthetic, haptic and emotive goals' scales as well as for hair esteem (Cronbach's alpha >0.75). Curl type was the only personal hair attribute that was correlated with hair goals and perceptions. From the demographic and lifestyle data, only age was correlated with goals and willingness to try new products. Common hair practices and product usage were also correlated with hair curl and goals.

**Conclusion:** The appropriateness of the instrument for measuring the strength of different hair goals and perceptions relevant to hair curvature degree and hair esteem has been validated. The instrument will support the development and testing of products better aligned with the manageability needs of very curly and textured hair. It was also confirmed that hair curvature is the most significant determinant of practices, and age of product attitudes.

**KEYWORDS**

curly hair, hair managibility, hair treatment, mixed methods studies, textured hair

**Résumé**

**Objectifs:** Cet article vise à développer et valider une taxonomie pour l'évaluation de l'expérience subjective de facilité de coiffage des cheveux bouclés. Il représente la dernière des deux étapes itératives d'un projet interdisciplinaire à méthodologie mixte.

**Méthodes:** La phase qualitative de l'étude comprenait une analyse thématique de 14 transcriptions d'entretien générées à l'aide d'une méthode vidéo-ethnographique (SEBE [Subjective Evidence Based Ethnography, Ethnographie fondée sur des preuves subjectives]). Un instrument basé sur l'enquête évaluant différents éléments contribuant à la facilité de coiffage des cheveux, conçu au cours de la première étape de ce projet, a été développé après consultation d'experts ayant une vaste expérience dans la recherche sur les cheveux, le développement de produits, les tests et la trichologie. L'instrument a été testé en ligne auprès de 506 participantes déclarant spontanément des cheveux bouclés naturels, de type 3A et supérieur, selon la classification d'Andre Walker.

**Résultats:** La définition initiale de quatre groupes d'objectifs capillaires a reçu une avis positif quant à la validité du contenu de la part des experts. Une fiabilité élevée a été obtenue pour les échelles des objectifs esthétiques, haptiques et émotionnels, ainsi que pour la bonne estime des cheveux (alpha de Cronbach > 0,75). Le type de cheveu était le seul attribut de cheveux qui était corrélé aux objectifs et aux perceptions des cheveux. À partir des données démographiques et de mode de vie, seul l'âge était corrélé aux objectifs et à la volonté d'essayer de nouveaux produits. Les pratiques capillaires courantes et l'utilisation de produit étaient également corrélées avec les cheveux bouclés et les objectifs.

**Conclusion:** L'adéquation de l'instrument pour mesurer la force des différents objectifs et perceptions capillaires en ce qui concerne le degré de courbure de la chevelure et la bonne estime des cheveux a été validée. L'instrument aidera au développement et à l'essai de produits mieux alignés sur les besoins des cheveux très bouclés et texturés en termes de facilité de coiffage. Il a également été confirmé que la courbure des cheveux est le facteur déterminant le plus important des pratiques, tandis que l'âge est le facteur déterminant le plus important des attitudes envers le produit.

# INTRODUCTION

Hair is an important contributor to the individual's personal and social identity [1, 2]. From a personal perspective, hair management involves specific choices that reflect a complex interaction of cultural, aesthetic and practical elements. The use of haircare and styling products and related practices thus are determined by and, in turn, influence these choices. Alongside hair colour, the fibre curvature and length have the most significant impact on hair assembly appearance, on the relative degree of complexity in the fibre manipulation via cosmetic products and on the longevity of the achieved styles. Three consumer-relevant dimensions of the construct '*hair manageability*' were introduced back in 1980s: style arrangement, style retention and flyaway [3]. However, although the authors of this paper referred to a wide range of hair curvature, length and style combinations, the three dimensions of manageability appeared better elaborated for straighter hair types. Furthermore, the combination of manageability perceptions, measurable hair assembly characteristics and the corresponding fibre properties is unique for everyone.

Thus, developing a conceptual framework within which curly hair *manageability* is comprehensively assessed at personal level will aid future product innovation and personalization.

This paper presents the second stage of a research project aimed at the development of a taxonomy for assessing the needs of curly hair by incorporating subjective personal perspectives, whilst relating these to the current scientific hair fibre and assembly knowledge. In the first stage, by applying a Subjective Evidence-Based Ethnography (SEBE) technique, curly haircare and styling data from 14 individuals was gathered and analysed. Four major themes emerged: *perceptions and hair goals, practices and processes, products and tools, people and influence*, and the first theme was also conceptually structured and tested via a quantitative online survey [4]. The present stage completes the detailed qualitative analysis of the remaining themes and extends and tests the initial construct, thus resulting in an instrument for assessing hair manageability subjectively.

## Methodological approaches for measuring novel constructs

Given the importance of hair for an individual's personal and social identity, research into hair management and perceptions can be supported with interdisciplinary research, which in turn will support better informed scientific research into the hair interactions with cosmetics. In the social sciences, developing an instrument/scale for measuring a novel construct follows well-defined methodological pathways. A mixed-method exploratory sequential research design is appropriate for this context as it allows for the in-depth exploration of concepts whilst offering generalizability [5–7]. It starts with a qualitative exploration directly involving personal perspectives and experiences of high relevance. The coded system of concepts that emerges from the qualitative data is then developed into an instrument/scale for evaluation which is tested quantitatively. Different validation steps could be followed to ensure that the final instrument has internal and external validity. For example, expert consultation is sought to ensure content validity, that is, to ensure that all relevant groups of questions are included [8], reliability and internal consistency are assessed statistically [9], whilst sampling different and/or larger groups could test external validity and improve accuracy [10]. A good instrument would enable reliable, consistent and comparative results across studies and the appropriate groups. Applied to hair manageability, such an approach could aid the establishment of a taxonomy for assessing fibre curvature and hair assembly in the context of a validated system of personal perceptions and objectives.

## Hair manageability and fibre curvature

Hair curvature has been investigated in relation to other fibre geometrical properties and negative correlations were reported between the fibre's curvature and its cross-sectional area and ellipticity [11]. The first attempt to relate individual fibre properties to hair assembly behaviour was in the form of a broad theoretical framework associating diameter, curvature, friction and surface properties with hair manageability, flyaway, body and style retention [12]. The framework encompassed all hair varieties and, in considering the specific effects of curvature, an assumption was made that most cosmetic products, other than hair perming and relaxing agents, did not impact on it significantly. A subsequent empirical investigation of the effects of fibre's characteristics on the hair assembly combability included hair ranging from straight to highly textured and a variety of products. Through regression analyses, combing ease was then quantified as a function of fibre curvature, stiffness and friction [13]. An important point made by the authors was that the curvature increased combing forces and progressively dominated combing as the hair curvature increased. However, this experimental study could not clarify if, in practical terms, the curvature effect would lead to personal preferences for avoiding combing altogether and what alternative 'manageability' perspectives should be considered.

In purely mechanical terms, overall fibre stiffness is the resistance to deformation within the fibre elastic region. Tensile, torsional and bending resistance are influenced to various degrees by the status of the cortex and cuticle structures as well as by some cosmetic actives [14]. The significance of stiffness for curly hairstyling and style retention is unknown, but the scarce amount of published data on tensile elasticity and cyclic fatigue highlights the difference in the viscoelastic behaviour of curly hair in comparison with straight fibres [14–16]. Thus, exploring how stiffness relates to curly hairstyling habits, as opposed to combing, is of relevance to the consumer.

Finally, hair nanotribology shows that single straight fibre friction increases with cuticle damage, for example, following bleaching, but conditioning treatments reduce it [17]. Whilst similar studies on curly/textured hair have not been published, it is reasonable to assume that conditioning would be replicated in terms of surface

modifications, but the impact on curly hair manageability would not parallel that of straight hair. The fibre and assembly friction contribution to the perceived haptic quality of the hair is also important in the context of cosmetic product applications. A study including a variety of hair types identified hair tress assembly friction as a function of the cuticle status, the fibre curvature and the degree of fibre alignment [18]. Further investigation with a focus on the curlier types would therefore be of interest.

Visual hair fibre and assembly characteristics of high relevance are primarily reported in the context of frizz reduction and gloss, often associated with permanent fibre straightening [19, 20]. With more people opting to grow hair in its natural form, the adaptations of these visual characteristics and measurements to curlier hair types are becoming more important.

In summary, the very few fundamental studies in the field have so far reported on the combability, mechanical and haptic quality of curly hair but have not explored the interactions with cosmetics to the levels achieved with straighter hair types. The variety in hair curvature as well as its dominant effect on many aspects of hair manageability make informative differentiation studies difficult. However, as consumers move away from chemical straightening and seek alternative care and styling products and practices, specialized curly/textured hair products and testing will become important. Thus, the construct of manageability of curly hair should be better defined technically and at personal level. The overall aim of this study is to elicit personal information of relevance to curly hair manageability and to support the development of a taxonomy for studying curly hair and product performance in a consistent manner.

## METHODS

This study follows a mixed method design with two iterative stages. In the first stage, the qualitative data collection followed the Subjective Evidence-Based Ethnography (SEBE) methodology [21]. The theoretical underpinning and process of SEBE were outlined in detail in the preceding paper. The first step of SEBE comprised First-Person Perspective (FPP) real time self-recordings of hair styling practices at the homes of the participants. The second step included Replay-Interviews (RIW) where participants and researchers reviewed and discussed the recordings. These interviews were recorded and the transcriptions were subjected to thematic analysis [22]. The emerging hair manageability construct was broad and rich in details. The first major theme of hair goals and perceptions was then developed into an evaluative instrument tested via an online survey.

The second stage of the study, reported in this paper, incorporates the remaining themes from the SEBE analysis and evolves and validates the evaluative instrument. Firstly, seven experts in hair research, product development and testing, patient care, and specialist education were consulted on the content validity of the original survey questions. The themes and specific questions were confirmed as appropriate, with suggestions for additions or rephrasing specific questions to better reflect the vocabulary of the broader community of consumers and to ensure clarity and consistent understanding (Table S1).

The thematic analysis of the three SEBE themes – *practices and processes, products and tools, people and influence* – also developed subthemes which were later incorporated into the expanded version of the survey. The expanded second survey was published via Qualtrics (Qualtrics, USA). The recruitment of participants took place via Prolific Academic (Prolific Academic Ltd, UK) with female participants in the United Kingdom and the United States being invited to participate. The overall research design process is depicted in Figure 1.

Testing for normality based on skewness and kurtosis revealed that data in our sample was generally normally distributed, with aesthetic, practical, and haptic goals as well as hair esteem exhibiting moderate, but significant skewness and kurtosis, but not emotive goals. Therefore, Spearman correlations and robust regressions were used where appropriate. The quantitative analyses were run in StataSE 17.0 (StataCorp, USA).

## RESULTS

### Qualitative data

Fourteen participants provided the material for the thematic analysis. Their curl type and demographic data are presented in Table 1. The three major themes of practices and processes, products and tools, and people of influence were further analysed. Practices and products appeared interrelated to the hair goals, hence, relevant questions were added to the survey as they were considered pertinent to understanding consumer's needs.

### Practices and processes

Three distinct hair practices were discussed at the Replay Interviews: (i) prewash practices; (ii) washing and related conditioning; (iii) hair styling (Figure 2). The first two practices were not included in the recordings but emerged in the conversations around the styling practice.
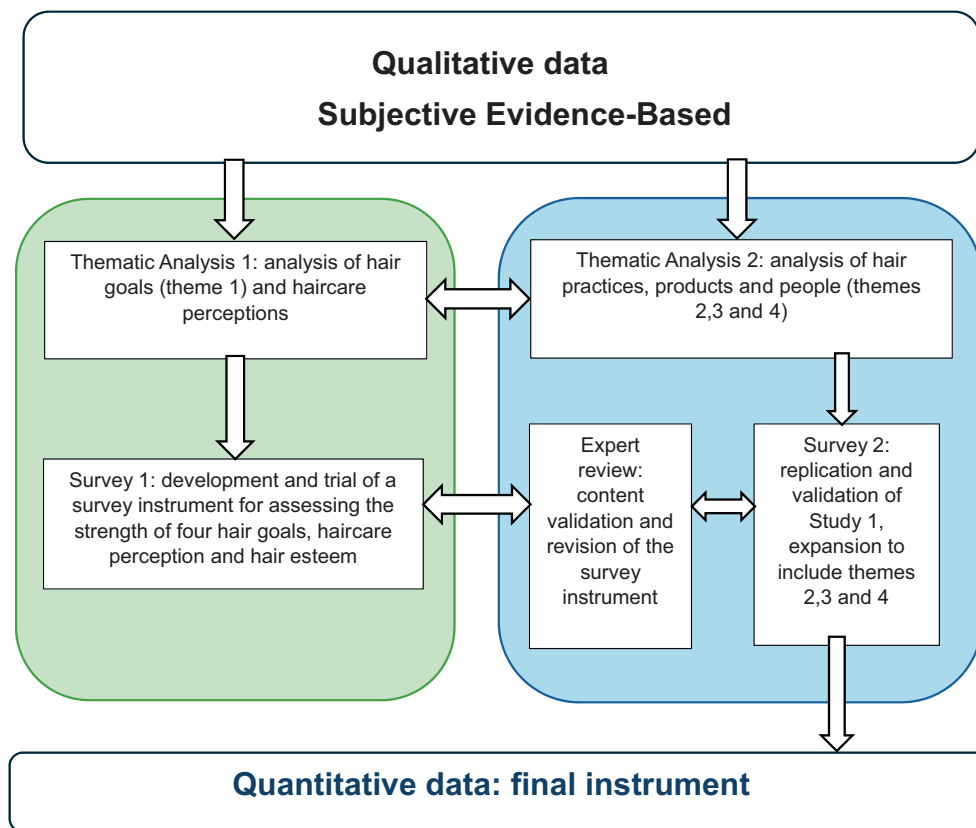
**FIGURE 1**  A flow diagram of the combined two-stage mixed method study design. Stage 1 is fitted within the green field (left) and stage 2 is fitted within the blue field (right).

Their specific purposes and significance were clearly articulated in the context of achieving the styling goals, and the timing and products used in the styling process. Prewash practices were mentioned by seven participants only and hence did not seem universal. Where present, prewash hair treatments addressed emotive health-orientated goals such as reducing hair breakage and treating scalp: 'Before I wash [the hair], I put some olive oil and I like to massage my scalp and leave it for a few hours' (P12). The hair washing and conditioning practices varied in terms of the products used and the exact process. In some cases, a typical shampooing followed by rinse off conditioning was used. In others, hair was washed with a conditioning cream only, or shampoo was only applied to the hair roots and rinsed without any mechanical hair manipulation. A range of practical and emotive goals were referred to, that is, no need to wash with shampoo (practical), ensure hair is conditioned (practical), prevent damage or breakage (emotive). The hair washing frequency ranged from twice per week to once every 2 weeks. As these practices were self-reported rather than observed directly, their significance to the styling practice was explored in more detail. Firstly, the frequency of washing was indirectly related to the styling, that is, washing the hair could be deemed needed based

on the negative haptic effect of accumulated styling products; secondly, the exact styling processes could be linked to the time proximity to the washing event, that is, styling immediately after washing is different from styling applied as a form of extending the period between washes. The exact processes adopted by individuals signified self-observation and implicit learning which contributed to achieving the personal hair goals. For participants with longer and more textured hair, washing and immediate styling was a specific process with a dedicated day or time slot in the week due to its length and complexity: 'It always takes a long time. Like... at least 45 min. That's if I'm doing it, like, haphazardly. If I'm really carefully parting it, it will take up to 2 h. Um..., if there's music in the background or I'm watching something it's more enjoyable' (P4). This would often be a weekend day, but sometimes also a week evening reserved for hair care. Hair drying tools were not commonly used, which added time to the process.

Participants generally put an emphasis on the practical goals reported by the preceding paper: efficiency and time management. This could be explained partly by the fact that the washing and styling routines explored in the study reflected daily styles and excluded special occasions where aesthetic goals could be dominant.

**TABLE 1** Demographic and hair-related descriptors of the SEBE participants.

| PID | Age | Self-described ethnicity | Curl type | Hair length | Hair care place | Frequency of wash | Video length |
|---|---|---|---|---|---|---|---|
| P1 | 31 | Mixed British/Afro-Caribbean | 4B | Below shoulder length when dry | Bathroom | 7–14 days | 3 min 46 s |
| P2 | 22 | Black British | 4C | Short, equal length | Bathroom | 7 days | 5 min 58 s |
| P3 | 25 | Mixed Irish/Jamaican | 3B | Shoulder length | Bathroom or bedroom | 7 days | 18 min 36 s |
| P4 | 24 | British (originally Sudanese) | 3B | Shoulder length | Bathroom | 7 days | 7 min 4 s |
| P5 | 32 | Black British | 4C | 30 cm or more when dry | Bedroom | 14 days | 7 min 56 s |
| P6 | 31 | Bahraini African | 4A | 10 cm below shoulders | Bathroom | 7–10 days | 47 min 18 s |
| P7 | 25 | White British | 3A | 10 cm below shoulders | Bedroom | 7 days | 15 min 19 s |
| P8 | 30 | Spanish (Latin American origin) | 3A | Slightly below shoulder | Bathroom | 2–3 days | 2 min 35 s |
| P9 | | Black British | 4B | Shoulder length | Bedroom | 7 days | 4 min 49 s |
| P10 | 26 | Mixed British/Afro-Caribbean | 4A | 40 cm below shoulder | Bathroom and bedroom | 7 days | 17 min 37 s |
| P11 | 22 | British Caribbean | 4C | Below shoulder | Bathroom | 7–10 days | 4 min 1 s |
| P12 | 24 | Black Mixed | 3C | 40 cm below shoulders | Bedroom | 7–14 days | 8 min 54 s |
| P13 | 52 | White British | 3A | 20 cm shoulders | Bathroom | 7 days | 2 min 19 s |
| P14 | 56 | White British | 3A | Above shoulders | Bathroom | 7 days | 2 min 58 s |

However, this also signifies the perceived utilitarian nature of hair washing, specifically in relation to the time it involved.

Hair styling practices took place once, twice or three times per week. The exact processes varied significantly, from curl reshaping or definition which consumed very little time (3–5 min) to working the whole hair assembly systematically by sectioning the hair, and/or hairline definition (>20 min) (Figure 3). For each participant, this process had specific steps, products and tools, and was explained by their hair specific goals and perceptions. Despite the variability of curl types and hair lengths, several common techniques were observed: the hair was partially wetted before product application (using wet fingers or a spray bottle), styling was mostly achieved using fingers, detangling and curl manipulation merged (Figure 4), heatless styling was universal: 'I tend not to use heat on my hair at all, because obviously it splits and stuff, so I tend to spend more time…' (P13); 'I don't dry my hair with a hair-dryer when I wear it curly because it does not look good' (P8). Where hair was sectioned for styling purposes, working the product and ensuring good coverage was achieved with smaller sections, yielding more elaborate results. The outcomes were evaluated on an ongoing basis

as a part of the process, with evaluations being based on visual or haptic goals: 'At the end it is neat enough' (P1); 'I can do it without seeing. So, if it's smooth, I'm fine, it's fine' (P6).

Whilst different possible variations of styles were demonstrated in the recordings, the processes identified in the interviews highlighted the following common fundamental processes of relevance to product development and testing: hair is wetted before styling, styling with fingers is common and hair is usually air dried.

## Products and tools

The discussions around the products fell into the following subthemes: commonly preferred product formats, '*good*' product attributes, product-hair interaction. Oils, leave-in conditioning creams of different viscosities, mousses and water-based gels were used. The product-specific attributes that were referenced were: good scent, lightweight (meaning no strong residue and greasiness), good absorption, clean feel (not oily). The product–hair interaction was expected to result in aesthetic outcomes without any negative visible or haptic product effect. The
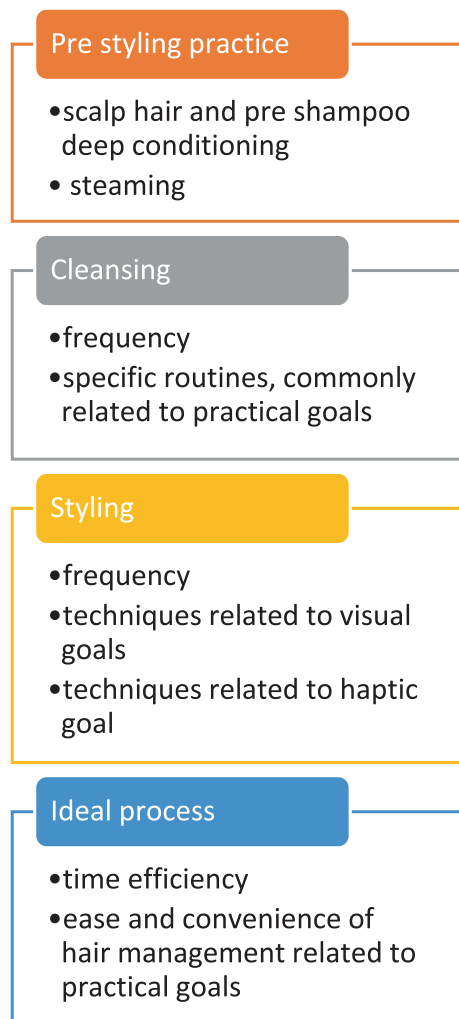
**FIGURE 2** Summary of the four main subthemes related to practices and processes.

styles reflected any combination of visual goals, for example, lustre, curl definition, neat and sleek appearance, and haptic goals, for example, hydrated (to feel like semi wet hair), smooth, soft and detangled hair. Different products were sometimes used according to the personal or social significance of the desired aesthetic goals: 'Mondays – it's just the hair wash for the sake of it, but the Friday hair wash is the better, the more important hair wash for the weekend, so I'll use the better shampoo and conditioner and products...' (P12). Additionally, all participants were asked to consider the functionality and efficacy of their 'ideal' hair product. The common 'ideal' product efficacy covered the above goals with additional practical goals such as humidity protection, preventing hair shrinking with time and more general style longevity. Time saving and process simplicity via multipurpose products was another goal: 'for me, the leave in and curl cream is just one too many steps. If I can have both in one, it would be ideal' (P6).

Several tools such as brushes, hair bands, pins, select fabric to soak the excess water were used to aid the processes.

## People and influence

Curly hair manageability advice was not readily accessible throughout childhood and younger years for everyone. Where relevant, female relatives passed traditions or introduced new ideas/products: '[My teenage daughter] is the one that now advises me: 'mum, you got to have this, you got to have this', she's the one that brought this (product) to my attention 'this is all over TikTok, people with curly hair are using this'...' (P13). Family influence did not extend too much into style choices and rather related to practical goals such as product/tool efficiency. Gifting products and special brushes or interesting products within the family was referenced several times, but not commonly. Social media sources provided more support with achieving practical and emotive goals and were the dominants source of information for those who were prepared to research products and practices: 'I follow this girl on YouTube...I've been implementing (what she says), and I feel like my hair has been breaking a lot less...' (P4). Hairdressers were not influential over styling and general care decisions, and there was a strong notion that most hairdressers were not trained/able to cut and style curly hair.

## Quantitative data

### Descriptive statistics

A total of 2800 participants took part in the initial screener study. Only participants who self-identified as having a hair type of 3A or higher according to the Walker Curl Type classification were invited for participation. A total of 548 responses was then collected, of which 42 had to be excluded because participants did not pass attention checks or indicated they did not fill in the survey with diligence. This resulted in a final sample of $n = 506$.

The participants in the sample were 40.8 years old on average, ranging from 20 to 76. About half of the participants self-identified their curl type as 3A (46.2%), followed by 3B (29.6%), and 4B (14.2%) and 4A (10.1%). Table 2 provides an overview of the various demographic and hair-related variables as well as key hair management process-related variables. Thus, this cohort replicated largely the demographic and hair-related variables from the first stage.

**FIGURE 3** Hairstyling practice illustrations derived from the First Person Perspective recordings and depicting the most common processes involved: Hair partitioning (top left), hair re wetting (top right), working small sections of hair systematically (bottom left), hairline definition (bottom right).

## Hair goals and hair esteem

The findings regarding hair goals and hair esteem generally replicate the findings from the first stage of this study, also adding significant findings for haptic goals and practical goals. Thus, all hair goals were positively correlated with each other, and hair esteem was positively correlated with emotive goals (Table 3).

## Hair length, curl type versus hair esteem and goals

A significant negative association of a similar size as in stage 1 between hair length and curl type was found $r(506)=-0.276, p<0.001$ meaning the curlier the hair, the likelier it is to be worn short. Notably, there were no significant correlations between hair length and the four hair goals and hair esteem as in study 1. A positive association of hair esteem and curl type was found $r(506)=0.134$,

$p=0.003$, meaning people with curlier hair held higher hair esteem (See Table S1 for the full correlation table).

## Demographics and hair-related data, perceptions of self-care or chore, time investment, hair esteem and goals

A significantly positive relationship between age and perceiving hair care as self-care ($r(506)=0.112$, $p=0.012$) and a significantly negative relationship between age and perceiving hair care as a chore $r(506)=-0.092, p=0.038$ were observed. A significant positive correlation between curl type and considering investing time into hair care ($r(506)=0.176$, $p<0.001$) and being knowledgeable about hair being important ($r(506)=0.198$, $p<0.001$) were observed too. Thus, age impacted most significantly on the perception of haircare as a chore or self-care, but people with curlier hair were more likely to consider learning about hair and investing time into hair care important.

**FIGURE 4**   First-Person Perspective material illustrating the detangling and curl manipulation process combined with working the styling products into the hair.

Perceiving hair care as self-care was positively correlated with all goals and hair esteem, whilst perceiving hair care as a chore was negatively correlated with hair esteem only $(r(506) = -0.279, p < 0.001)$. These findings largely replicate the results from part 1 too.

## Relationship between hair length, curl type and practices-related questions (new questions added following the completion of the SEBE data analysis)

Unsurprisingly, there was a significant negative association between hair length and curl type $r(506) = -0.276$, $p < 0.001$ and higher curl type was statistically significantly higher in black women $(r(506) = 0.641, p < 0.001)$ and lower in white women $(r(506) = -0.550, p < 0.001)$. Curl type was positively correlated with sectioning hair prior to styling $(r(506) = 0.219, p < 0.001)$, using prewash treatments $(r(506) = 0.226, p = 0.041)$ and styling frequency for professional occasions $(r(506) = 0.127, p = 0.004)$, and negatively

correlated with brushing $(r(506) = -0.091, p = 0.041)$ and washing one's hair $(r(506) = -0.307, p < 0.001)$. Hair length was significantly positively correlated with washing one's hair $(r(506) = 0.115, p = 0.010)$ but there were no correlations with other practical variables (Table S2). Hence, hair curvature, but not length, appears relevant to haircare and styling practices most broadly.

## Relationships between demographics, hair goals and hair esteem and product-related questions

Significant positive correlations between attaching importance to using hair products specifically designed for one's hair and curl type $(r(506) = 0.105, p = 0.019)$ and aesthetic $(r(506) = 0.282, p < 0.001)$, practical $(r(506) = 0.226, p < 0.001)$, haptic $(r(506) = 0.179, p < 0.001)$ and emotive $(r(506) = 0.265, p < 0.001)$ goals, respectively. Hence, the curlier the hair is, the higher the expectations for suitable products to achieve all hair goals are.

Significant positive correlations between attaching importance to short haircare and styling routines and practical ($r(506) = 0.269$, $p < 0.001$), haptic ($r(506) = 0.146$, $p = 0.001$) and emotive ($r(506) = 0.144$, $p = 0.001$) goals, respectively, were observed too, meaning that only aesthetic goals did not appear related to the need to keep the haircare and styling practices short. A significant negative correlation between looking for affordable products and age was observed ($r(506) = -0.113$, $p = 0.011$), as well as a significant positive correlation with practical goals ($r(506) = 0.127$ $p = 0.004$). Finally, significant positive correlations between enjoying trying new products and age ($r(506) = 0.094$, $p = 0.034$), aesthetic ($r(506) = 0.131$, $p = 0.003$), haptic, ($r(506) = 0.188$, $p < 0.001$) and emotive ($r(506) = 0.159$, $p < 0.001$) goals were observed. In summary, older women appeared less price sensitive and more willing the try new products, with emphasis on aesthetic, haptic and emotional goals, and less so on practical goals.

## DISCUSSION

The expanded analysis of the qualitative data identified common haircare and styling practices amongst individuals with curly hair with varied lengths and degree of curvature. Whilst the variability in the participant profiles is considered challenging in standalone quantitative studies, in qualitative terms, it allowed for rich data collection to inform priorities in product development and testing. All four major practices included references to the achievement of aesthetic, haptic and practical goals, thus confirming the relevance of the hair goal construct in the personal routine choices. Unsurprisingly, cleansing was orientated towards practical goals whilst styling towards the aesthetic and haptic goals. The quantitative data confirmed that women with curlier hair wash and comb their hair less frequently but are more likely to engage with prewashing and styling practices perceived as self-care. The references to the closely interrelated sequences of washing and styling processes suggest that some studies of curly hair would be more reflective of the consumer experience if multiple product/routine applications were included with specific attention being given to the target goals to be addressed.

The product-related discussions are also connected to different products' suitability for achieving one or more of the hair goals, whilst the significance of cost and the willingness to try new products added new dimensions to this major theme. A key emerging association was the importance attached to specifically designed products in order to meet all hair goals. As longevity of the results appeared

**TABLE 2** Demographic, hair-related and key hair management variables in the survey results.

| Variable | Distribution in the sample |
|---|---|
| Age | Average 40.8 years, Median 39, Std. Dev. 12.33 years, Range 20–76 years |
| Ethnicity | White 65.1%, Black 20.8%, Mixed 10.8%, Asian 3.3% |
| Hair length | 39.9% 20–30 cm, 25.9% 30–40 cm, 19.6% 10–20 cm, 8.5% >40 cm, 6% <10 cm |
| Walker Curl Type | 46.3% 3A, 29.5% 3B, 14.2% 4B, 10.1% 4A |
| Hair style | 53.4% loose hair shorter than shoulder length), 17.6% hair bun, 16.4% ponytail, 5.6% pleat/ weave, 3.8% loosely pleated, 3.2% Other |
| Brushing frequency | 34.6% Daily, 30.6% Every 2–3 Days, 15% More than once per day, 10.1% Once a week, 9. 7% Less than once a week |
| Washing frequency | 44.1% Every 2–3 Days, 31.8% Once a week, 17.2% Less than once a week, 6.7% Daily, 0.2% More than once per day |
| Styling frequency | 42.9% Daily, 32.2% Every 2–3 Days, 11.7% Once a week, 9.9% Less than once a week, 3.4% More than once per day |

**TABLE 3** Correlations between the four hair goals and hair esteem.

| | Aesthetic goals | Practical goals | Haptic goals | Emotive goals | Hair esteem |
|---|---|---|---|---|---|
| Aesthetic goals | 1 | | | | |
| Practical goals | 0.297*** $p < 0.001$ | 1 | | | |
| Haptic goals | 0.400*** $p < 0.001$ | 0.319 $p < 0.001$ | 1 | | |
| Emotive goals | 0.360*** $p < 0.001$ | 0.329*** $p < 0.001$ | 0.299*** $p < 0.001$ | 1 | |
| Hair esteem | 0.160** $p = 0.003$ | 0.089* $p = 0.047$ | 0.126* $p = 0.005$ | 0.275*** $p < 0.001$ | 1 |

*Note*: * = significant at the 0.05 level, ** = significant at the 0.01 level, *** = significant at the 0.001 significance level.

so frequently in the "ideal product" discussions, extending the product efficacy should be a major goal, especially in the context of repeated applications. Additionally, the very common practice of hair rewetting before styling product application suggests that sufficient hair surface wetting is challenging for many products. This could be attributed to the curly hair fibre's shape and form impacting on the initial contact with products, as well as to the rheology and dispensing mechanisms of the products being more suitable for straight hair assembly. Finally, with age, the emphasis on cost management decreased, whilst the interest in experimenting increased, thus the users' demographic characteristics influence the product choices.

The overall objective of the second part of this study was to expand and validate an instrument for measuring hair goals, esteem and perceptions of women with very curly and textured hair that had emerged from an initial mixed methods exploratory study [4]. Firstly, the content validity of the questionnaire was confirmed by the experts who agreed with the relevance of all existing questions and the suitability of the scale. Small adaptations to some questions were made, and further lifestyle information was also collated following suggestions from the experts. Drawing on the full SEBE data analysis, questions related to the products and practices were added too. Furthermore, the sample size at stage 2 was doubled to increase the statistical power of the proposed instrument. The target participant remained the same, however, this sample also included participants from the USA. The hair-related (curl type, length and hair style) and demographic characteristics (e.g. age, ethnicity, employment) of the sample were reproduced in the second survey, hence the nationality of the participants was deemed of lesser significance. Following the redeveloped question groups, the internal consistency and reliability of the hair goals constructs were retested. A marked improvement in the Cronbach α-coefficient for Aesthetic Goals (0.73 in part 2 vs. 0.56 in part 1) was noted and attributed to the improvement of the question-wording following the experts' suggestions about relevant curly hair aesthetic attributes. The haptic and emotive goals' reliability remained very similar (0.70–0.77). A Cronbach α-coefficient > 70 is considered acceptable for a sample size >100 [13]. The Cronbach α-coefficient of the practical goals remained the lowest (0.65) and equal to that achieved at stage 1 despite the addition of some questions specific to practices. The practicality construct of curly haircare therefore continues to appear challenging to quantify. One consideration was that the individual's lifestyle had a significant impact on the exact nature and the degree of relevance of the different dimensions (questions) within the practical goal group, and following the experts' suggestion, more data were collected to explore possible associations. However, the practical

goals composite score was not associated with age or any lifestyle data (employment, hours worked or sports) nor directly with the degree of hair curl or hair length, brushing and styling frequencies. In light of the importance of practical goals emerging from the SEBE analysis, further work on the internal validity of this construct is needed.

The hair esteem subscale continued to return the highest reliability (0.93) which could be attributed to its derivation from the well-established Rosenberg self-esteem scale [23]. Since this construct has psychological relevance and offers an important confirmation of the personal meaning haircare holds for many, it was deemed an important element of the overall construct of hair management (care and styling) and manageability. Furthermore, its correlation with hair goals and curl type strengthens the argument that it is a helpful contributor to understanding the motivations and practices behind curly haircare and styling. Given the similarity of findings across the two studies, despite the inclusion of participants from the US, the result also suggests that hair esteem is relevant to women with curly hair beyond the specific context of the United Kingdom, but further testing with samples from around the world will be essential.

Another interesting finding is that the hair length is not correlated with the hair goals or hair esteem, whilst curlier hair is correlated with higher emotive goals and hair esteem. This could be reflective of the cultural influences in women with textured hair which occupy the highest curl type categories and these differentiators are important. The absence of length-related hair manageability goals and practices also contrasts with the emphasis on hair weathering management in straight hair, where cuticle erosion and frayed cortex are observed in the distal fibre end. One explanation is that both visual and haptic quality of curly hair are dominated by the curl pattern (from personal and instrumental measurement's perspectives), another theory is that due to the curl pattern, curly hair weathering occurs differently from that of straight hair. Further research will be helpful to explore these questions. Finally, the perception of haircare as self-care increased with hair esteem and all but the practical goals signifying further that products and routines for curly hair management are not entirely utilitarian in nature.

In summary, the overall construct of hair goals and esteem as well as hair care perceptions remained strongly related to hair curvature. Although more detailed demographic data were available, it was not associated with hair goals and esteem, however, further investigation of the practical goals is needed to reduce the conceptual heterogeneity. The expanded practices and product-related questions also confirmed that curvature and hair esteem are the most significant correlates of hair goals,
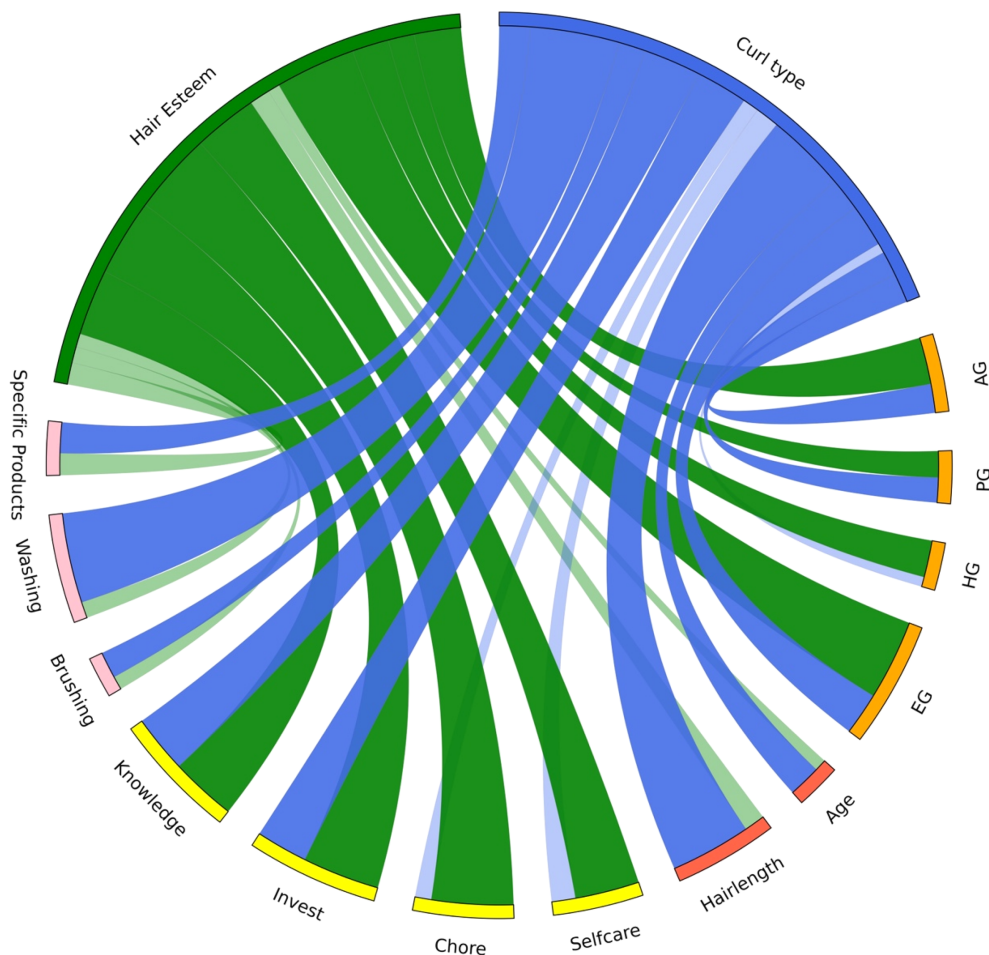
**FIGURE 5** Chord diagram visualizing the correlations between hair esteem (green), curl type (blue), and key variables in the sample. Hair goals are presented in orange, demographics in red, hair care perceptions in yellow, and practices in pink. The thickness of the chord indicates correlation strength. Light chords depict non-significant relationships.

haircare/styling perceptions and practices, product attitudes and key demographic attributes. Figure 5 presents a visualization of the most relevant associations in the study. The qualitative findings concerning people and other influences were not deemed suitable for quantification in the survey, but this content further highlights the perceived relative lack of knowledge around curly hair management amongst families and the hairdressing profession.

## CONCLUSION

The original hair *manageability* construct from the 1980s did not reflect all curly/textured hair characteristics of relevance to achieving and maintaining curly and textured hair styles (and haircare more generally). The instrument presented in this study provides a construct of hair goals and perceptions with specific questions

for each goal that can be used to assess hair/product interactions in laboratory conditions. Some elements of aesthetic and haptic goals are already commonly assessed instrumentally, and most can be assessed sensorially; however, the instrument allows to adapt these to the subjective experiences of people with curly hair. Furthermore, groups of questions can be applied separately or combined to measure the strength of different aspects of hair/product interactions. As the composite goal and hair esteem subscales were tested for content validity, reliability and generalizability, they could be used for comparisons in consumer studies with some caution applied to the practical goals. The hair esteem score can offer a further dimension to exploring the consumer attitudes. In this context, regression models were deemed of no specific practical value.

This instrument, or parts of it, can also be applied to more narrowly defined curl type groups as the practice-related questions suggest that specific routine frequencies

are curvature driven. Furthermore, although the curliest/textured hair has been identified as being most closely related to strong emotive goals and the qualitative data suggested some family tradition-driven practices, the aesthetic and haptic goals of the adapted routines are common for everyone.

In summary, this updated instrument provides an extension to the taxonomy for identifying and classifying curly hair needs and a validated instrument for hair care researchers to measure personal hair goals and perceptions whilst relating hair curvature more closely to specific care and styling practices. It could also serve as framework for developing consumer-focused guide to product/practice recommendations, customised to the individual's goals, curl type and interests in experimentation.

## CONFLICT OF INTEREST STATEMENT
The authors acknowledge no conflict of interested.

## DATA AVAILABILITY STATEMENT
In accordance with the data protection and privacy constraints of this project, the qualitative data (video material and transcripts) cannot be shared. The quantitative data is being further analysed and cannot be shared at this time. Please contact the authors for further information.

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.