

Anthropometric and ergonomic assessments of braiding activity among female hairdressers in Lesotho using the ART method

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SUMMARY

Hairdressers in their careers are at a high risk of work-related musculoskeletal disorders (MSD). The braiding process requires hairdressers to endure prolonged repetitive hand movements and awkward body postures. This study conducted hand anthropometric measurements of female hairdressers in Lesotho and assessed their risk of muscle injury during hair-braiding activities using the Assessment of Repetitive Task (ART) method. Results found that braiding activity is at high risk of muscular injury.

KEYWORDS

Braiding, Assessment of Repetitive Task, Anthropometry, Hairdressers

Introduction

Hair-dressing involves prolonged standing, repetitive hand movements, awkward trunk and upper-limb posture, and long working hours, which may contribute to discomfort, pain, fatigue, and musculoskeletal disorders among hairdressers (Ercan et al, 2022). According to the Korean Group for Occupational Medicine, 61% of hairdressers complained about shoulder pain, 59.9% of neck pain, 53% of lower back pain, and 42% of hand and wrist pain (Sy et al, 2016). Braiding is the interlacing of two or more strands at an angle (Talha et al, 2021), which is especially popular among African women. However, various braiding styles take between 3.5-14 hours to complete depending on the client's head size, hair type, and volume. Moreover, a braider must execute more than 50 repetitive wrist and finger motions in 1 minute, increasing their discomfort rate in the fingers and wrist/hand. Therefore, this study aims to capture hairdressers' activities in Maseru, Lesotho; measure their hand anthropometric dimensions to provide a reference for automatic braider design; and assess the braiding process using the ART method to determine the risk of muscle injury.

Methodology

Forty-one female hair-dressers, aged from 21 to 46 years old, were recruited from 14 different hair salons in the Maseru, Lesotho. Their hand anthropometric dimensions were measured using a flexible measuring tape and a plastic ruler. Among them, nineteen subjects were further observed and interviewed about their hair salon activities, and one of them was randomly selected to be assessed throughout the braiding process using the Assessment of Repetitive Task (ART) tool (HSE 2010).

Results

Hand anthropometric dimensions were shown and compared with Pheasant (2003) and Ching-yi and Deng-chuan (2017) in Table 1.

Within a day of observation, we found that 17 hairdressers received 1-5 customers for hair braiding, and two hairdressers received 6-10. To complete a large braid, 17 hairdressers took 1-2 hours, and two hairdressers took 3-4 hours. To complete a medium braid, ten hairdressers took 1-2 hours, and nine hairdressers took 3-4 hours. To complete a small braid, all the hairdressers reported a 3–4-hour work.

For the ART results (see Table 2), we assessed the whole braiding process for 3 hours and 45 minutes, which includes 10 minutes of hair washing, 15 minutes of hair drying, and 3 hours and 20 minutes for braiding. Results indicated that hair washing is at a moderate-risk level, hair drying at a low-risk level, and braiding is the most hazardous task at a high-risk level for both sides.

Table 1. Hand anthropometric dimensions of female hairdressers in Lesotho

Hand dimensions(mm)	This study				Pheasant (2003)	Ching-yi and Deng-chuan (2017)
	Min	Max	Mean	SD	Mean	Mean
Hand length	158	188	173	8.5	174	167.9
Palm length	95	117	105	5.6	97	-
Thumb length	51	67	56	4.6	47	-
Index finger length	59	72	66	3.9	67	-
Middle finger length	60	82	76	5.8	77	-
Ring finger length	60	78	68	3.9	66	-
Little finger length	48	62	54	3.7	50	-
Thumb breadth	17	25	21	2	19	-
Index finger breadth	12	18	15	1.9	18	-
Hand breadth (metacarpal)	72	82	77	2.7	76	75.2
Hand breadth (across thumb)	87	96	91	2.5	92	-
Maximum spread	162	189	176	6.5	190	-
Grip breadth inside width diameter	36	47	41	2.2	48	38.3
Grip breadth inside length diameter	27	31	31	1.9	-	30.7

Table 2. ART results of hairdressing work activities

	Hair washing		Hair drying		Braiding	
	Left	Right	Left	Right	Left	Right
Task score	24	24	22	23	33	33
Duration multiplier	0.5	0.5	0.5	0.5	0.75	0.75
Exposure value	12	12	11	11.5	24.75	24.75
Risk	Moderate	Moderate	Low	Low	High	High

Conclusion

The ART results confirm that hairdressers are at a high injury risk during braiding due to awkward postures and repetitive upper limb movements. Therefore, a new design of an automatic braiding machine with an ergonomically-design handle will be suggested to create a more comfortable braiding process with faster speed and fewer injuries for hairdressers.

References

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