Gesture Interaction in Music Listening Environment:

A Comparative Study of Desktop and Gesture Control Devices

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Abstract

Natural operation mode may be the key to music experience in the future. As an intuitive communication language, gestures have been one of the ways of human-computer interaction for many years. However, there are few studies comparing traditional interaction with gesture interaction. The author conducted a heuristic research to test the desktop and gesture control devices through daily music playing tasks, so as to clarify the appropriate commands for each music playing function. The purpose of this study is to fill the current research gap, increase the evidence of comparative research, and evaluate the differences between the two modes of operation.

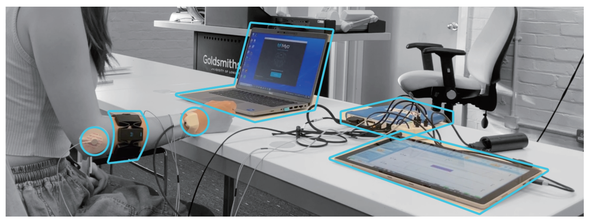
Background

The way of music consumption has undergone a major change in history. In the late 20th century, devices such as walkman liberated music from static state and made it possible to carry it with you. Digital music and streaming media further promote the unbounded development of music.

Gesture control technology then came into being. Nowadays, this technology is gradually applied to the music industry, allowing DJs and artists to manipulate complex sound effects through simple gestures. The rise of VR, AR and wearable technology further indicates that music will be more personalized and interactive.

Experiement Design

However, the gesture control technology needs further research and optimization. The author conducted a comparative study to explore the differences between gesture interaction and traditional interaction in music listening environment.



Subjects: 10 participants (6 female, 4 male)
Subjective point of view: user's mood, action and language.
Objective evidence: task completion time, error rate and scale results.

Devices:	Tasks:	Testing Sequence:
1. Desktop 2. Myo Armband	1. Play 2. Next 3. Previous 4. Pause	1. Default (desktop first) 2. Myo First

Results

Descriptive Statistics

Fig1. Descriptive Statistics of Error Rates for Desktop and Myo armband

Devices	Test Sequence		Play	Next	Previous	Pause
Desktop	Default	Mean	0	0	0.1	0
		Median	0	0	0	0
		Std. Deviation	0	0	0.224	0
		Range	0	0	1	0
		Minimum	0	0	0	0
		Maximum	0	0	1	0
	Myo First	Mean	0	0	0	0
		Median	0	0	0	0
		Std. Deviation	0	0	0	0
		Range	0	0	0	0
		Minimum	0	0	0	0
		Maximum	0	0	0	0
Myo	Default	Mean	0.19	0.2	0.41	0
		Median	0	0	0.25	0
		Std. Deviation	0.256	0.274	0.298	0
		Range	1	1	1	0
		Minimum	0	0	0	0
		Maximum	1	1	1	0
	Myo First	Mean	0.3	0.16	0	0.02
		Median	0.2	0.1	0	0
		Std. Deviation	0.346	0.184	0	0.04
		Range	1	0	0	0
		Minimum	0	0	0	0
		Maximum	1	0	0	0

Myo Armband is more prone to errors than Desktop, which indicates the need to explore specific interactions of design or ergonomic problems.

Fig2. Descriptive Statistics of Task Completed Time for Desktop and Myo armband

Devices	Test Sequence (0=default; 1=M First)		Play	Next	Previous	Pause
Desktop	Default	Mean	3.06	2.14	4.21	1.26
		Median	3.04	2.07	2.2	1.2
		Std. Deviation	1.495	1.248	3.925	0.157
		Range	4	3	9	0
		Minimum	1	1	1	1
		Maximum	5	4	10	2
	Myo First	Mean	1.73	1.06	1.16	1.21
		Median	1.07	1.17	1.21	1.01
		Std. Deviation	1.526	0.248	0.145	0.451
		Range	4	1	0	1
		Minimum	0	1	1	1
		Maximum	4	1	1	2
Myo	Default	Mean	3.83	2.49	4.04	2.81
		Median	4.09	1.55	3.8	3.2
		Std. Deviation	0.489	1.695	2.521	1.984
		Range	1	4	6	5
		Minimum	3	1	2	0
		Maximum	4	5	8	5
	Myo First	Mean	2.99	3.33	0.95	3.7
		Median	3.27	1.69	0.77	2.26
		Std. Deviation	1.346	4.344	0.633	2.589
		Range	4	10	2	6
		Minimum	1	1	0	1
		Maximum	5	11	2	7

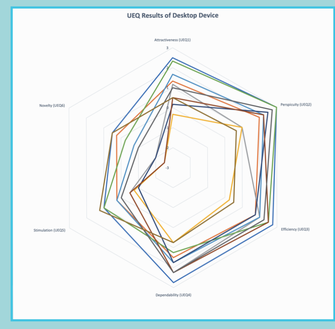
In devices and sequences, "previous" and "paused" tasks usually take longer, which indicates that these tasks may be more complicated or less intuitive in nature for users.

Fig3. Descriptive Statistics of SUS and UEQ for Desktop and Myo armband

Devices	Test Sequence (0=default; 1=M First)		SUS	Attractiveness	Perspicuity	Efficiency	Dependability	Stimulation	Novelty
Desktop	Default	Mean	76	1.27	1.85	1.75	1.8	0.05	-0.9
		Median	77.5	1.33	2	2	1.75	0.25	-0.75
		Std. Deviation	9.45	1.03	0.859	0.919	0.758	0.694	1.33
		Range	25	3	2	3	2	2	3
		Minimum	60	0	1	0	1	-1	-3
		Maximum	85	3	3	3	3	1	1
	Myo First	Mean	77	0.9	2.23	1.9	1.65	0.15	-1.05
		Median	75	0.5	2.5	2.25	1.75	0	-1
		Std. Deviation	7.37	0.853	0.918	0.84	0.652	0.962	1.23
		Range	18	2	2	2	2	2	3
		Minimum	73	0	1	1	1	-1	-3
		Maximum	90	2	3	3	2	1	1
Myo	Default	Mean	54.5	1.2	1	0.55	0.35	1.6	1.35
		Median	55	1	0.75	0.5	0.5	1.25	1.25
		Std. Deviation	15.65	0.768	1.09	0.925	1.098	0.84	0.454
		Range	38	2	3	3	3	2	1
		Minimum	40	0	0	-1	-1	1	1
		Maximum	78	2	3	2	2	3	2
	Myo First	Mean	56.5	1.23	1.45	0.7	0.9	1.3	1.7
		Median	50	1.17	1.75	1	1.25	1.25	1.5
		Std. Deviation	17.37	0.304	0.991	0.779	1.025	0.326	0.647
		Range	38	1	3	2	3	1	2
		Minimum	40	1	0	0	0	1	1
		Maximum	78	2	2	2	2	2	3

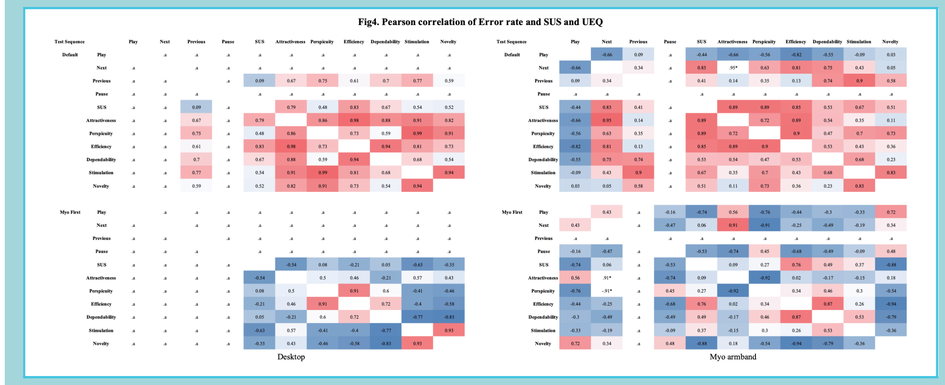
Myo Armband's low SUS score indicates issues with interface usability and functionality.

Gesture recognition and system response still have a lot of room for improvement, but the technology has already piqued the interest of users.



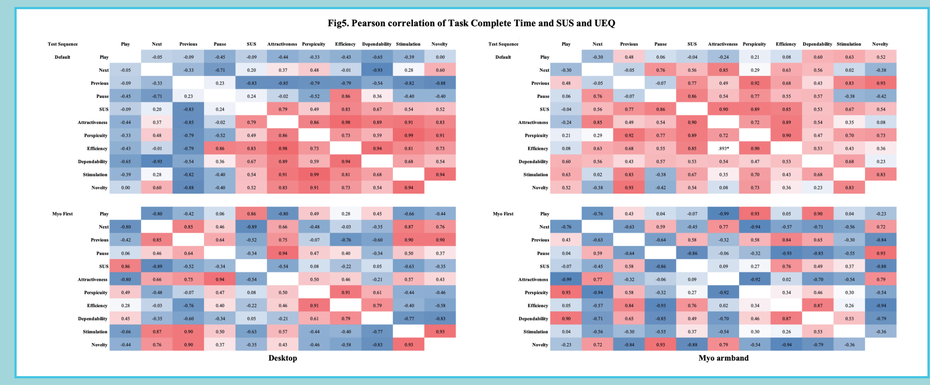
Myo Armband's high scores for "Stimulation" and "Novelty" are indicative of the product's potential and user interest in it.

Inferential Statistic



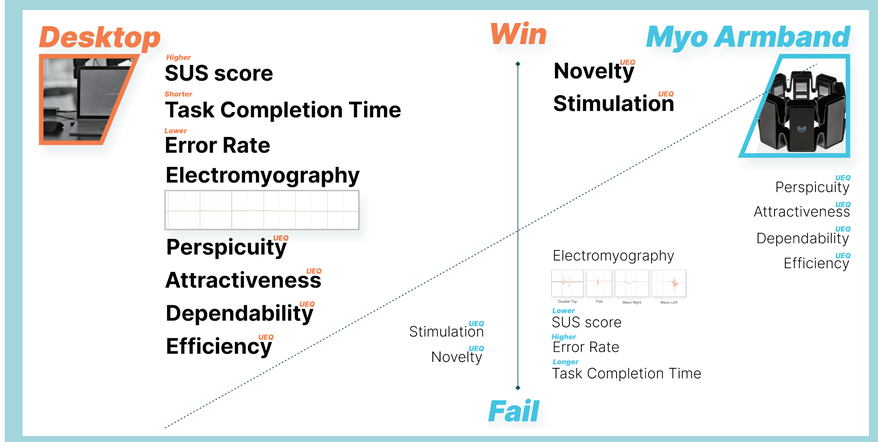
There is a strong negative correlation between various UEQ subscales when using desktop devices under Myo First sequence, which may be due to the judgment deviation caused by the participants who have experienced Myo armband under this sequence.

Myo armband with default test sequence shows a strong positive correlation between UEQ subscales.



When using desktop devices, Attraction, Perspicuity and Stimulation are the most relevant dimensions of multi-task completion time in UEQ.

For Myo Armband,a longer completion time leads to a lower SUS score.



Conclusions

Desktop devices showed the expected correlation.

1. Users usually equate good usability with efficient operation and reliable system.

2. Although excitement or novelty can enhance the user experience, they will not seriously affect the overall system availability perception in the desktop environment.

Myo Armband reveals more subtle results

1. Although the Myo armband is a novel device, users still give priority to efficient operation as a critical indicator of usability.

2. Interestingly, although the unique interface of the Myo armband is attractive, it may also pose challenges in initial adaptability and learnable habits. This emphasises the necessity of balancing innovation and intuition in design.

However, the change in correlation between the two devices emphasises the complexity of the user experience. Devices like Myo Armband redefine the interaction paradigm, which requires a complex understanding of user expectations and adaptability. For example, the strong correlation between excitement and novelty shows that although users are excited about new technologies, it is crucial to ensure that these innovations also meet usability standards.