The Correlation Analysis and Kruskal - Wallis Test of the Relationship between AD Placement and the Information Acceptors Cognitive Behavior - A Case of Bilibili Life-Theme Video Platform

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Abstract. Benefiting from the popularity of short videos, Bilibili becomes one of the most vibrant video communities in China and establishes unparalleled leadership among Generation Z+. Since Bilibili commits that they would never set pre-roll advertisements, companies can only collaborate with uploaders, who are the video makers and the owners of video channels, to make product placement (or ad placement, brand placement) in the videos. In order to investigate the influence of product placement in Bilibili life-themed video on viewers' perception, the researcher obtained the data of 150 life-themed videos (including data about the number of video plays, likes, coins, favorites, share, level of product placement, the location where the brand first appeared, etc.), and used SPSS 19 as a tool to make correlation analysis and Kruskal-Wallis Test. According to the results, the author made five conclusions. First, viewers of life-themed videos on Bilibili approve uploaders for product placement and secondly, viewers would like to share the video containing brand placement. The study also conclude that the making product placement in the second half of the video is more likely to be accepted by the audience. Fourthly, audience does not want all the product placement to be concentrated in one part of the video. Finally, the majority of viewers believe that product placement has no relevance to video quality. In the long term, these analyses and findings can provide guidelines for video creators especially vloggers on Bilibili to conduct business activities and finally facilitate virtuous development of the Bilibili platform.

Keywords: Bilibili, product placement, Kruskal–Wallis Test, correlation Analysis, SPSS

1 INTRODUCTION

In previous researches, Li Liang studied the factors influencing the effect of product placement in variety shows [1], and some scholars also explored the effect of implantable advertising on viewers' psychology [2] [3], mostly using cases from variety shows or movies, but none of the literature mentioned the effect of brand placement on short videos. With the popularization of mobile devices, ad placement was widely used in many platforms such as Bilibili. In this paper, the author will study the covert ad placement in videos [4], taking 150 videos from the living area (a form of categorization for videos on Bilibili) as samples, and the sample videos will be

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released until September 7,2021. In order to control variables and eliminate the influence of other factors on the results, the themes of all videos are about daily life, and their creators' followers were between 110,000 to 170,000. By making correlation analysis and Kruskal–Wallis Test, this research can guide uploaders (video creators on Bilibili) to make a good combination of business activities and video creation, and thus facilitate the virtuous development of the Bilibili platform.

2 CORRELATION ANALYSIS

According to Truong and Simmons, online advertisements were believed to bring intrusiveness and worsen user experience [5], which can be reflected by the number of likes, shares, favorites, and coins given by the audiences. In modern social networks, likes means users or viewers like what they saw, and adding it to favorites means they add the content they consider valuable to a special file folder so that they can view it again later without spending much effort searching for it. Besides, users or viewers can also share the content they are watching to other applications or websites by touching the share button. Moreover, if viewers think the video they are watching is of relatively high quality or creativity, they can insert coins, which is a unique way of support on Bilibili, to show their higher level of satisfaction or joy. Since each user only have a limit number of coins, inserting coins is comparatively valuable to some extent.

To eliminate the effects of factors related to video plays, the researcher collected the data on likes, shares, favorites, and coins from the Bilibili platform and calculated the ratio of each of these data to the number of video plays. On top of that, because the extent of ad placement in videos are different, the researcher classifies product placement into three levels, no product presence, mention of the product or brand, and commercial promotion. Among them, in the level of mentions product and brand, uploaders may only share the goods they are using, rather than cooperating with companies. The commercial promotion is to directly cooperate with the brand company. Besides, as the past research proved mid-roll commercial breaks are more effective than pre-roll advertising [6], the relationship between the position of product placement and viewers' feedback may exist. Thus, each video is equally divided into three parts: front, middle, and back. Not only the location of the first appearance of the product placement is recorded, but also the number of the parts where the ad appears is marked.

In order to achieve the objective of this research, Spearman's rank correlation coefficient is chosen since the explanatory variable (level, position of product placement) is the categorical variable and the response variable (like-to-play ratio, share-to-play ratio, favorite-to-play ratio, and coin-to-play ratio) is the numeric variable.

Spearman Correlation Coefficient is one of the most famous nonparametric measures [7]. The procedure was applied to evaluate the correlation of two statistical variables. The rank correlation coefficient is express as formula (1):

$$rs=1- (6\Sigma d2i) /n (n2-1) \quad (1)$$

n: the observations of the two variables are ranked from smallest to largest and assigned 1, 2, 3, ..., n respectively.

di: the difference between the levels of the observations of the two variables.

The range of variation of Spearman Correlation Coefficient is from - 1 to 1. The absolute value of [0, 0.3) is weak correlation, [0.3, 0.7) is medium correlation, [0.7, 1] is strong correlation, and the larger absolute value means the stronger correlation.

			Level	Like-to-play	Coin-to-play	Favorite-to-play	Share-to-play
Spearman's rho	Level	Correlation Coefficient	1.000	.320**	.101	.260**	.211**
		Sig. (2-tailed)	.	.000	.219	.001	.010
		N	150	150	150	150	150
	Like-to-play	Correlation Coefficient	.320**	1.000	.587**	.490**	.503**
		Sig. (2-tailed)	.000	.	.000	.000	.000
		N	150	150	150	150	150
	Coin-to-play	Correlation Coefficient	.101	.587**	1.000	.553**	.421**
		Sig. (2-tailed)	.219	.000	.	.000	.000
		N	150	150	150	150	150
	Favorite-to-play	Correlation Coefficient	.260**	.490**	.553**	1.000	.634**
		Sig. (2-tailed)	.001	.000	.000	.	.000
		N	150	150	150	150	150
	Share-to-play	Correlation Coefficient	.211**	.503**	.421**	.634**	1.000
		Sig. (2-tailed)	.010	.000	.000	.000	.
		N	150	150	150	150	150

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 1: Spearman correlation analysis of the level of the product placement, like-to-play ratio, share-to-play ratio, favorite-to-play ratio and coin-to-play ratio.

As figure1 shows, at the 0.01 level (2-tailed), there is a significant medium positive correlation between the level of the product placement and like-to-play ratio ($r=0.3<0.320<0.7$, $p=0.0001<0.01$). Significant weak positive correlation is found between level of the product placement and share-to-play ratio ($r=0<0.211<0.3$, $p=0.0095<0.01$) and between level of the product placement and favorite-to-play ratio ($r=0<0.260<0.3$, $p=0.0013<0.01$). However, correlation between level of the product placement and coin-to-play ratio is not significant ($p=0.219>0.05$).

			Position	Like-to-play	Coin-to-play	Favorite-to-play	Share-to-play
Spearman's rho	Position	Correlation Coefficient	1.000	.213**	.076	.180*	.188*
		Sig. (2-tailed)	.	.009	.357	.028	.021
		N	150	150	150	150	150
	Like-to-play	Correlation Coefficient	.213**	1.000	.587**	.490**	.503**
		Sig. (2-tailed)	.009	.	.000	.000	.000
		N	150	150	150	150	150
	Coin-to-play	Correlation Coefficient	.076	.587**	1.000	.553**	.421**
		Sig. (2-tailed)	.357	.000	.	.000	.000
		N	150	150	150	150	150
	Favorite-to-play	Correlation Coefficient	.180*	.490**	.553**	1.000	.634**
		Sig. (2-tailed)	.028	.000	.000	.	.000
		N	150	150	150	150	150
	Share-to-play	Correlation Coefficient	.188*	.503**	.421**	.634**	1.000
		Sig. (2-tailed)	.021	.000	.000	.000	.
		N	150	150	150	150	150

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Figure 2: Spearman correlation analysis of the position of product placement, like-to-play ratio, share-to-play ratio, favorite-to-play ratio and coin-to-play ratio

At the 0.01 level (2-tailed), there is a significant weak positive correlation between the position of product placement and like-to-play ratio ($r=0<0.213<0.3$, $p=0.009<0.01$) (Figure 2). On top of that, at the 0.05 level (2-tailed), significant weak positive correlation is also found between position of product placement and share-to-play ratio ($r=0<0.188<0.3$, $p=0.021<0.05$) and between position of product placement and favorite-to-play ratio ($r=0<0.180<0.3$, $p=0.028<0.05$). Whereas, correlation between position of product placement and coin-to-play ratio is not significant. ($p=0.357>0.05$).

			Parts	Like-to-play	Coin-to-play	Favorite-to-play	Share-to-play
Spearman's rho	Parts	Correlation Coefficient	1.000	.292**	.068	.291**	.235**
		Sig. (2-tailed)	.	.000	.405	.000	.004
		N	150	150	150	150	150
	Like-to-play	Correlation Coefficient	.292**	1.000	.587**	.490**	.503**
		Sig. (2-tailed)	.000	.	.000	.000	.000
		N	150	150	150	150	150
	Coin-to-play	Correlation Coefficient	.068	.587**	1.000	.553**	.421**
		Sig. (2-tailed)	.405	.000	.	.000	.000
		N	150	150	150	150	150
	Favorite-to-play	Correlation Coefficient	.291**	.490**	.553**	1.000	.634**
		Sig. (2-tailed)	.000	.000	.000	.	.000
		N	150	150	150	150	150
	Share-to-play	Correlation Coefficient	.235**	.503**	.421**	.634**	1.000
		Sig. (2-tailed)	.004	.000	.000	.000	.
		N	150	150	150	150	150

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 3: Spearman correlation analysis of the number of the ad parts, like-to-play ratio, share-to-play ratio, favorite-to-play ratio and coin-to-play ratio

As figure3 shows, at the 0.01 level (2-tailed), there is a significant weak positive correlation between the number of the ad parts and like-to-play ratio ($r=0<0.292<0.3$, $p=0.0003<0.01$). Significant weak positive correlation is also found between the number of the ad parts and share-to-play ratio ($r=0<0.235<0.3$, $p=0.004<0.01$) and between the number of the ad parts and favorite-to-play ratio ($r=0<0.291<0.3$, $p=0.0003<0.01$). However, correlation between the number of the ad parts and coin-to-play ratio is not significant. ($p=0.405>0.05$).

3 KRUSKAL–WALLIS TEST

As the result shows, the correlation between the level of product placement / position of product placement/ the number of the ad parts and the coin-to-play ratio is not significant, which means each pair of these variables are independent. Therefore, these three pairs of variables meet the requirement of the Kruskal–Wallis Test.

Compared with ANOVA, which can only be used to analyse data conforming to a normal distribution, the Kruskal-Wallis Test is a nonparametric statistical test that assesses the differences among three or more independently sampled groups on a single, non-normally distributed continuous variable. [8]

Ranks

	Level	N	Mean Rank
Coin-to-play	0	69	71.58
	1	50	75.88
	2	31	83.61
	Total	150	

Figure 4: Ranks of Kruskal-Wallis Test

Test Statistics[a,b]

	Coin-to-play
Chi-Square	1.647
df	2
Asymp. Sig.	.439

a. Kruskal Wallis Test
b. Grouping Variable: level

Figure 5: Test Statistics of Kruskal-Wallis Test

Ranks

	Position	N	Mean Rank
Coin-to-play	1	46	42.37
	2	28	34.79
	3	7	56.86
	Total	81	

Figure 6: Ranks of Kruskal-Wallis Test

Test Statistics[a,b]

	Coin-to-play
Chi-Square	5.290
df	2
Asymp. Sig.	.071

a. Kruskal Wallis Test
b. Grouping Variable: location

Figure 7: Test Statistics of Kruskal-Wallis Test

Ranks

	Parts	N	Mean Rank
Coin-to-play	0	69	71.58
	1	44	79.53
	2	21	80.71
	3	16	74.47
	Total	150	

Figure 8: Ranks of Kruskal-Wallis Test

Test Statistics[a,b]

	Coin-to-play
Chi-Square	1.253
df	3
Asymp. Sig.	.740

a. Kruskal Wallis Test
b. Grouping Variable: parts

Figure 9: Test Statistics of Kruskal-Wallis Test

According to the Figure 4 to 9, no significant difference is shown by the coin-to-play ratio in different levels (P=0.439>0.05), different positions (P=0.071>0.05) and the different number of parts (P=0.740>0.05), which means a change in level or in position or in number of parts does not result in a change in coin-to-play.

4 CONCLUSION

4.1 Viewers of life-themed videos on Bilibili approve uploaders for product placement.

To a certain extent, the significant positive correlation level of the product placement and the like-to-play ratio is evidence that audiences in living area of Bilibili do not consider ad placement to be intrusive. Instead, quite a few audiences believe that the goodies recommendation or product placement made by the uploaders is practical and may be helpful in the future, which is the reason why level of the product placement and favorite-to-play ratio have a significant positive correlation. On top of that, there are other explanations for this approval. As a matter of fact, many users on Bilibili exactly know that it is not easy for uploaders to create good videos and make ends meet, so income from advertisements may help video creators to produce content in higher quality. Even some fans of the uploaders regard product placement as a sign of uploaders' rising influence since no companies would like to collaborate with uploaders who are not famous enough.

4.2 Viewers of life-themed video on Bilibili would like to share the video containing brand placement.

The significant positive correlation level of the product placement and share-to-play ratio shows that viewers are motivated to engage in the sharing behavior. In the author's opinion, unlike typical video advertisements, making product placement is more vivid and interesting and less stiff and offensive since the style like personal vlog makes both products and uploaders closer to audiences and easier to be accepted.

4.3 Making product placement in the second half of the video is more likely to be accepted by the audience.

According to the data, the more backward the product placement appears for the first time in the video, more audience gives their likes, shares, favorites and coins.

4.4 Audience does not want all the product placement to be concentrated in one part of the video.

The result shows that concentrating all ads in one section is not a good choice. Therefore, uploaders can place ads multiple times, but each time should not be too long, so that product placement can leave a lasting impression on the audience and not be offensive at the same time.

4.5 Majority of viewers believe that product placement has no relevance to video quality.

Since giving coins represents the user recognition of video quality and creativity, if product placement would lower the video quality, this effect should be reflected in coin-to-play ratio. However, there is no significant difference of coin-to-play being actually observed in different ads levels, different positions and different number of parts. Thus, most of users of Bilibili still regard content as the main criterion for judging and do not have bad reviews towards the videos containing product placement.

5 LIMITATIONS

Considering the labor cost and time cost, this study only chose 150 videos from the living area on Bilibili as samples, which is limited and not sufficient to represent all the videos or even videos in the living area on Bilibili. In addition, the position of product placement is simplified as three parts in this paper. To improve the accuracy of the results, the researcher can precisely record the position of product placement in the video and thus obtain numerical variables instead of categorical variables. If conditions permit in the future, more samples including videos on different themes will be collected so that researchers will be able to conduct comparative analysis of product placement in videos on different themes and gain more comprehensive conclusions.

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