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Young children in China and the UK have difficulty recognizing advertisements on search engine pages

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Abstract

Background: Most research into children's understanding of advertising has been about television advertising aimed at children. There has been little research into children's awareness of web advertising.

Methodology: This paper investigates children's ability to recognize advertisements on search engine pages in mainland China and in the UK. A total of 256 children aged 6-12 years from schools in mainland China and in the UK were tested to examine how well children of different ages could recognize search engine advertisements. Experimental materials comprised 34 invented web pages similar to the output pages of web searches. Half the pages contained picture-based advertisements, and half contained text-based advertisements.

Results: We found that children's ability to recognize the advertisements improved with age, but children could only recognize most of the advertisements at 12 years of age. This age is much older than when children can recognise television advertisements. We emphasise that young children have difficulty recognizing advertisements on search engine pages.

Conclusion: We suggest that search engine pages need to identify advertisements more clearly and that advertising guidelines and regulations need to take into account the difficulty that children have in distinguishing advertisements from content.

Keywords: Children; Search engine advertising; Advertising formats; Culture difference; Web advertising recognition

Introduction

Due to children's direct and indirect purchasing power, marketers have attempted to embed their advertising in children's lives for decades [1,2]. Besides watching TV and using print media, today's children can be targeted by marketers when they search, watch, play and read on the Internet via computers and other mobile devices [1,3-5]. The expanding advertising landscape challenges the way that children used to cope with advertising [6,7]. Based on theories, such as the theory of consumer socialization [8] and the processing of commercial media content (PCMC) model [9], children aged 12 years and above are able to reason abstractly, and use information storage and retrieval strategies at the same time. Hence, the age of 12 years has been regarded as a threshold at which children have developed the required skills to cope with advertising, and it is acceptable to advertise to children after that age as if they are adults [8]. Children who are younger than 12 years old are assumed to be vulnerable to advertising effects as they have not developed essential skills to process advertising [10].

To protect those children below 12 years old from advertising effects, some governments and organizations in Western countries have focused on television advertising that is aimed at children, and have produced reports such as *Self-Regulatory Program for Children's Advertising* in the US [11], or *Unfair Commercial Practice Directive* in the EU [12]. Despite existing regulations, there is still a lack of regulation to protect children from new interactive and embedded advertising formats. The UK has been the first country to issue relevant guidance, Recognition of *Advertising: Online Marketing to Children* under 12, in 2017, which required advertisers to improve their online disclosure so that children could more easily identify web advertisements [13].

China has one of the largest child populations in the world, and its birth control policies have given children great influence over family resources and spendings [14,15]. While in mainland China, only about 3% of advertising-related regulations and laws refer to children [16], which focus on advertising' role in building children's socialist spiritual civilization that conductive to criticism of adverting [17,18]. And the only one standard came from the Article 37 of the *Advertising Regulation Standard* defined children's advertising as 'advertising of products to be used by children or advertising using children as models', without clear about broadcasting platforms and how to regulate children targeted advertising without children models [19].

This paper aims to provide empirical evidence that young children have difficulty recognizing advertisements on the search engine pages and has implications to better regulate online advertising environment to children and improve the children-targeted advertising regulations in mainland China.

Literature review

Children's awareness of television advertising

Advertising to children has been studied since the 1970s, but attention has focused on the effects of television advertising on

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children [1- 20]. Researchers have recruited children to examine their recognition and understanding of television advertising mostly in western countries, such as the US [21], UK [22], Australia [23], and Netherlands [7].

However, compared to western countries, there has been much less research in China about the effects of advertising on children and about children's awareness of advertising [17,24]. Chan [14] was one of the first to investigate Chinese children's understanding of televising advertising. Chan found that children aged 7 to 8 years were beginning to understand television advertising, which was a similar finding to most western studies.

Children's recognition of web advertising

There has been a growing interest in new forms of advertising, which is more likely to be embedded in the editorial content, resulting in blurred boundaries between advertising, entertainment and information, such as and web advertising [3, 25]. A typical example of embedded advertising, web advertising delivers picture-based, text-based and picture-text-mix formats, and blurs the boundaries between advertising, information and entertainment [3, 25]. As more children are going online [26-31] there is an increasing amount of web advertising aimed at children that raises concerns about the fairness and appropriateness of such advertising [1, 32].

In academia, only a minority of research focuses on web advertising. In terms of advertising recognition, Ali et al [3] recruited children aged 6-, 8-, 10- and 12-year-olds from Indonesia and UK, and presented them with printed web pages including images and text in which one or two images were advertisements. Children were asked to point to any parts of a web page that they thought were advertisements. The 6-year-olds could identify less than a third of the advertisements, the 8-year-olds could identify about half, and the 10- and 12-year-old children could identify about three-quarters of the advertisements on the web pages. As noted above, children can recognize television advertisements from about 5 years of age, so Ali et al.'s findings suggest that recognizing online advertisements is achieved much later than recognizing television advertisements. However, Ali et al [3] focused on children's recognition of picture-based advertising messages and these may be easier to comprehend than text-based messages for children [33-35].

Children's recognition of search engine advertising

A search engine is a program that searches for and identifies items in a database that correspond to keywords or characters specified by the user, and presents the results in a list which includes both picture- and text-based information. Education and entertainment are the two main reasons for children's use of search engines [36]. Identifying advertisements on search engine pages may be particularly difficult for children. Ofcom [31] reported that only a minority of 8- to 15-year-olds in the UK understood the sponsored nature of search engine advertising. To investigate children's recognition of advertisements on search engine pages. Li et al. [25] carried out an experiment similar to Ali et al. [3], but used pages that looked like the output pages of search engines in the UK. Li et al. recruited 60UK children, presented search engine web pages to the children and asked them to point to the advertisements on the pages. The 8-year-olds identified very few of the advertisements they were shown; 10-year-olds identified about half of the advertisements, and 12-year-olds identified two-thirds. These results showed that children had at least as much, if not more difficulty, recognizing advertisements on search engine pages as on other web

pages. However, Li et al. [25] only recruited a small number of UK children.

Cross-national comparisons between China and the UK

Most studies of children's awareness of advertising, including identifying advertising and understanding the intention of advertising, have been conducted only within a single country [7, 14, 23], but culture can have an effect on children's consumer socialization [37]. There are differences between China and the UK in advertising culture, such as the development of media and related regulations [38, 39], differences in language [40] and differences in the orthography children learn [41].

Compared with some western countries, the introduction and adoption of television in China occurred much later. For example, in the UK, household television ownership reached 95% in 1970, and the average household television ownership was 1.48 in 2018 [42,43]. In China, television broadcasting started in 1958, and the prevalence of television reached 99% of China's population by the end of 2017 [44]. China introduced the Internet in 1995, and household Internet penetration reached 60% by the end of 2018 [45]. In the UK 90% of households had access to the Internet in 2018 [46]. As most contemporary UK households now have Internet access, no urban-rural divide would be expected in the UK.

In relation to advertising policy regulations, the UK has a clear definition of 'children', which refers to individuals under the age of 16 years. In the UK a series of codes regulate advertising to children, including the UK code for Non-broadcast Advertising and Direct & Promotional Marketing, and the UK code for Broadcast Advertising which are regularly reviewed and updated by the Advertising Standards Authority (ASA) [47,48]. The UK was the first country to issue guidance about online marketing, Recognition of Advertising: Online Marketing to Children under 12, in 2017. This guidance required advertisers to improve their online disclosure so that children could more easily identify web advertisements [13].

The introduction of television in China was later than in the UK, and advertising in China developed later, together with advertising-related regulations [49]. The Chinese regulations do not define an age when individuals should be considered as children, and the existing regulations do not take into account Internet advertising platforms.

Researchers from China and some western countries suggest children's early reading begins with picture-books, and from these children go on to improve their reading and literacy abilities [35, 50]. There are three stages of children's early reading development. At first stage, children show an interest in reading and treat pictures and texts as the same. At the second stage, children still focus and obtain information from pictures rather than texts although they realize texts also have meaning and that texts are different from pictures. At the last stage, children gradually transfer their attention from pictures to texts during reading, and develop their literacy abilities (e.g., writing) [35, 50]. Researchers using eye-tracking methods have also found pre-school children first pay attention to pictures and then transfer their attention to texts as they get older [35, 50].

Chinese and English are generally considered to be different language groups. To learn English, children need to build the corresponding relationship between letters and phonological segments in a word, and create access to the meaning of words [51]. The majority of Chinese characters are pictophonetic characters, which comprise a sound and a meaning component, and readers can receive strong cues of the identity of the character from its visual form [52]. Compared

with other countries, there is only a little research in China focusing on children's early reading and its development. Zhou and Liu [35] found that Chinese children's ability to grasp the key information from pictures improved from 4 to 6 years old when it became a stable ability. Zhou and Liu [35] suggested that although English and Chinese belong to different language groups, children generally go through the same three stages to develop their early reading. Such similarities in early reading development suggest that there might not be a large enough difference between English and Chinese language processing to affect children's information processing of web pages or web page advertising.

Methodology

Current research aims

Our studies extended Li et al's [25] finding with much larger samples from mainland China and the UK, and search engine results pages have a similar structure in mainland China and in the UK. One aim of the present paper was to establish the age when children can recognise advertisements on search engine pages. Age is an approximate measure of children's development, and age is the basis for all recommendations in national guidelines about advertising to children. All national guidelines use age (rather than cognitive development) as a basis for regulation [22]. The main research question was at what age children can identify all or most of the advertisements that are included on a search engine page.

To investigate this question and to establish findings that were not specific to one culture or one type of web page we carried out studies in China and in the UK. One group of children was from mainland China and the other group children were tested in the UK. In this way we could consider if findings generalised to children in different countries. We also considered two aspects of search engine advertising advertisements that were text based and advertisements that were picture based, because the only previous research [25] focused on picture-based advertising. By including children from two countries, and by including both picture-based and text-based advertising we could address the research question as broadly as possible, and draw definitive conclusions about the age when children successfully recognize search engine advertisements. Establishing when children can recognise such advertisements has immediate implications for guidelines about what advertising children should be exposed to when they use search engines.

Li et al. [25] found little difference between UK and Chinese children's recognition of web advertisements on non-search engine results pages. In another cross-cultural study, Ali et al. [3] compared children's recognition of web-based advertisements in the UK and in Indonesia, and there was no difference between Indonesian and UK children's recognition of web advertising. Given the lack of cultural differences in Li et al. and Ali et al. with advertisements on typical web pages, we did not expect differences between UK and Chinese children in their ability to recognize search engine advertisements. But the inclusion of a UK sample was important to find out if children's recognition of such advertisements was similar irrespective of culture and language.

The present paper includes two studies that examined Chinese and UK children's recognition of advertisements on search engine results pages. We used the same set of search engine results pages translated between Chinese and English in China and the UK.

Participants

Participants in Study 1 were recruited from an urban primary school in Yantai, Shandong Province in mainland China from January to March 2017. In Study 2, children were from an urban school in England. The schools in each area were typical state schools for those areas. In each study, 128 children were recruited who were randomly chosen from their schools. They were divided into four age groups, 6-year-olds, 8-year-olds, 10-year-olds and 12-year-olds (Table 1). In each age group of 32 children, half were girls and half were boys. All three studies received ethics approval from the Department of Psychology Ethics Sub-Committee at the first author's University. Permission was also obtained from the school head teachers, class teachers and parents before conducting the study. The children were asked if they were willing to take part on the day of the study.

Materials

Thirty-four web pages were invented to avoid any effects due to children's previous experience with actual search engine results pages. Each page had a search based on a key word, which was selected randomly from Chinese and UK children's school-textbooks. The pages were designed to look like search engine results pages of Baidu, Haosou 360, Sougou and Google China, which are four of China's top search engines. In the UK study, all the web pages were translated into English (see Figure 4) and used the four top UK search engines Google, Bing, Yahoo and Ask as templates. Invented search engine names were used for the UK web pages in the study to avoid any effects of familiarity with actual search engine names.

There were four main parts of the invented search engine results pages, two parts contained text-based messages and the other two parts contained picture-based messages. Those messages were randomly laid out in the four main parts of the page, not including the search bar (Figure 1). The first page was a practice page that clearly labelled the four parts with numbers. The experimental pages were similar to the practice page, but did not have any numbered areas.

Each web page contained only one advertisement. Half of the pages contained only one text-based advertisement (Figure 2) and the other half of the pages contained only one picture-based advertisement (Figures 3 and 4).

Before conducting the experiment, all 34 invented pages were presented to a group of 10 adults from mainland China and 20 adults from UK, and they were asked to point out what they thought was an advertisement on each page. All the adults consistently and correctly identified all the advertisements quickly. Hence, our invented search engine results pages had advertisements that could easily be identified as such by adults. During the study the search engine results pages were randomly presented on a laptop screen. The procedure was the same in all three studies.

Procedure

The children completed the experiment individually in a quiet room, accompanied by one of their teachers and the experimenter. The

Table 1: The mean age and standard deviation for the three groups.

	Mainland China		UK	
	Mean	SD	Mean	SD
6-year-olds	6.38	0.49	6.21	0.42
8-year-olds	8.41	0.5	8.31	0.47
10-year-olds	10.25	0.44	10.13	0.34
12-year-olds	12.28	0.48	12.31	0.47

Figure 1: The practice page with numbers to label the areas on the web page.

Figure 2: Chinese search engine page with one text-based advertisement. The advertisement is highlighted in a red rectangle in this figure. The rectangle was not shown on the actual materials.

Figure 3: Chinese search engine page with one picture-based advertisement. The advertisement is highlighted in a red rectangle. The rectangle was not shown on the actual materials.

teachers took no part in the experiment. During the procedure, the child was asked to fill in a brief of pre-test questionnaire to check their access and use of the television and Internet. The child was also asked questions about their past experience of using search engines, their awareness of television advertising and gave examples of television advertising. Then the child was shown the web pages in a random order on a computer screen. For each web page the child was asked to point to the part of the page that he/she thought was an advertisement, and they would not be corrected even if they made the wrong choices. To help children better understand the requirements, each child was first presented with a practice web page on which the four main parts of the web page were labelled with numbers (Figure 1).

Apart from the practice page (see Figure 1) that had numbers and rectangles to indicate positions, the remaining invented web pages were presented without labels to ensure they were as similar as possible to the results pages of actual search engine pages. Children were told that they could ask for help from the experimenter if they forgot the numbers of the four main areas during the task. If children needed help reading any part of the text on the web pages the experimenter read out that text. Most 6-year-olds required help, the 8-year-olds asked for help in reading sometimes, the 10- and 12-year-olds rarely asked for any help in reading the materials.

Results

Children were scored as correct if they accurately identified where the advertisement was on the web page. Table 2 shows the mean number and percentage of advertisements recognized by each age group. As there were four areas on the search engine web page, the chance of a child being correct by guessing was one in four (25%). Our two dependent variables were the number of children who correctly recognized picture-based search engine advertisements, or text-based search engine advertisements. Our independent variables included age (6-year-olds, 8-year-olds, 10-year-olds and 12-year-olds), children's weekly Internet usage in hours, and location (mainland China, and the UK).

From the pre-test questionnaire, we found that all children could give at least one correct example of a television advertising, so we expected they could recognise television advertising and knew what the word 'advertisement' meant. We found that UK children spent longer time using the Internet each week (Table 2).

Preliminary analyses showed that weekly Internet usage (in hours) did not have an effect on the number of picture-based advertisements recognised by children ($F_{(1, 382)} = 8.58$, $p=0.152$), or on the number of text-based advertisements ($F_{(1, 382)} = 0.739$, $p=0.391$), or on the number of total advertisements ($F_{(1, 382)} = 3.62$, $p=0.058$).

As shown in Figure 5, the 6-year-old children recognized about a quarter of the search engine advertisements, the 8-year-olds recognized about one-third, the 10-year-olds recognized nearly three-quarters and the 12-year-olds recognized most of the advertisements (Figure 5).

A Kolmogorov-Smirnov test showed that none of the dependent variables were normally distributed, so a Kruskal-Wallis test was used to compare performance between the age groups. Results showed significant differences across four age groups for the number of correctly recognized search engine advertisements, $\chi2 (3) = 289.69$, $p < 0.001$, for the number of correctly recognized picture-based search engine advertisements, $\chi2 (3) = 269.70$, $p < 0.001$, and for the number of correctly recognized text-based search engine advertisements, $\chi2 (3) = 270.14$, $p < 0.001$. In Table 3, Mann-Whitney tests were used to follow up these findings. A Bonferroni correction was applied to control for Type 1 errors, and all effects are reported at a $0.05/4 = 0.0125$ level of significance (Table 3).

Table 2: Mean hours spent on the Internet in a week.

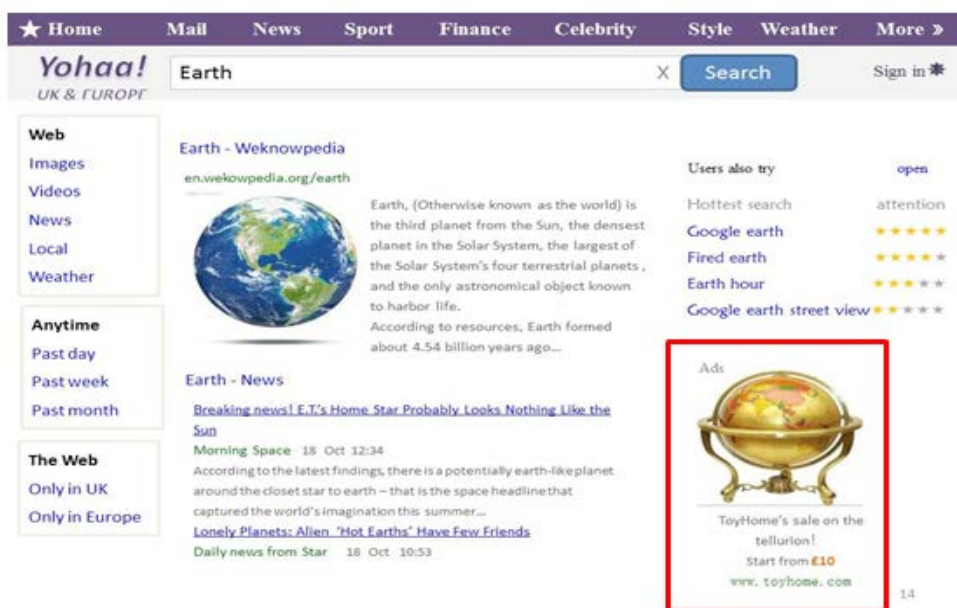|	Chinese	UK
6-year-olds	0.73	6.25
8-year-olds	0.93	6.97
10-year-olds	0.83	6.81
12-year-olds	1.05	7.18
Mean	0.89	6.8

Figure 4: UK web page for Study 3 with a picture-based advertisement which is highlighted in a red rectangle (the rectangle was not shown on the actual materials). This page is a translation of one of the Chinese web pages used in Studies 1 and 2.
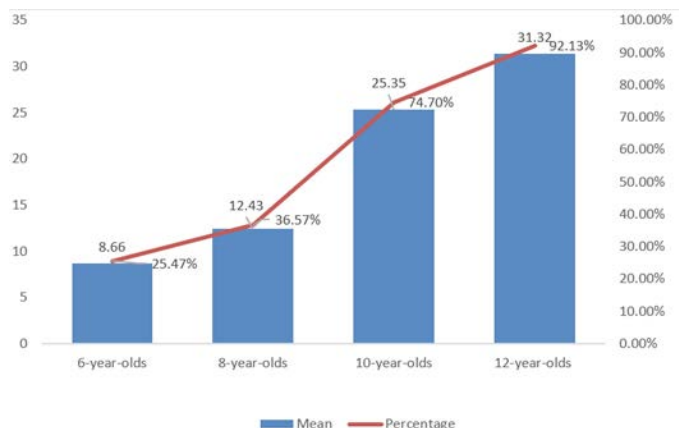
Figure 5: The mean and percentage of correctly recognized advertisements for each age group (maximum possible score was 34).
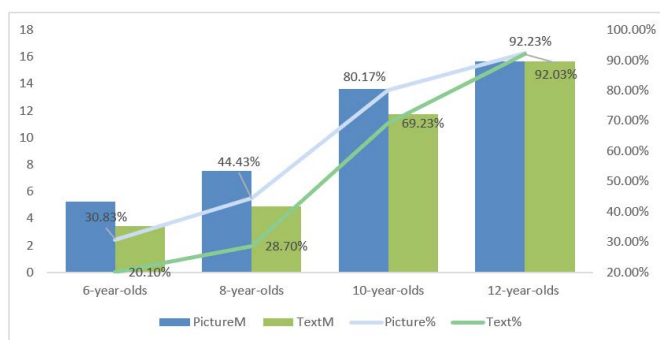

Figure 6: The mean and percentage of correctly recognized picture-based and text-based advertisements for each age group.

To investigate whether there was a difference in the number of correctly recognized picture-based and text-based search engine advertisements, a Wilcoxon test was applied. There was a significant difference in recognising the two types of advertisements, $z=-8.28$, $p<0.01$, $r=-0.42$. Corresponding to Figure 6, comparing the performance for the number of correctly recognized advertisements for each age group showed better recognition of the picture-based advertisements than the text-based advertisements by the 6-year-olds, $z=-4.73$, $p<0.001$, $r=-0.48$, by the 8-year-olds, $z=-5.12$, $p<0.001$, $r=-0.52$, and by the 10-year-olds, $z=-5.15$, $p<0.001$, $r=-0.53$. There was no difference for the 12-year-olds, $z=-0.77$, $p>0.05$, $r=-0.08$. In other words, all the age groups, except the 12-year-olds, were better at recognizing picture-based advertisements than text-based advertisements. There was no difference in 12-year-olds' recognition of picture-based and text-based advertisements (Figure 6).

As shown in Table 4, only for the 8-year-olds was there a significant difference between UK and Chinese children in recognizing total advertisements. All age groups of UK children were significantly poorer at recognizing the picture-based advertisements than were the Chinese children. There were no differences between UK and Chinese children in recognizing the text-based advertisements in any age group (Table 4).

Discussion

The aim of this paper was to establish whether children could recognise advertisements they saw on search engine pages. In two studies with broadly converging findings, we found that 6-years-old

Table 3: Mann-Whitney U tests between four age groups for correct recognition of advertisements.

Picture-based Advertisements	6-year-olds	8-year-olds	10-year-olds	12-year-olds
6-year-olds		U=2703.50	U=273.50	U=94.50
		p<0.0125	p<0.0125	p<0.0125
8-year-olds			U=848.00	U=181.00
			p<0.0125	p<0.0125
10-year-olds				U=2149.00
				p<0.0125
Text-based advertisements	**6-year-olds**	**8-year-olds**	**10-year-olds**	**12-year-olds**
6-year-olds		U=3400.0	U=422.5	U=79.0
		p<0.0125	p<0.0125	p<0.0125
8-year-olds			U=888.0	U=130.0
			p<0.0125	p<0.0125
10-year-olds				U=1456.0
				p<0.0125
Total advertisements	**6-year-olds**	**8-year-olds**	**10-year-olds**	**12-year-olds**
6-year-olds		U=2223.5	U=235.0	U=96.0
		p<0.0125	p<0.0125	p<0.0125
8-year-olds			U=648.5	U=137.0
			p<0.0125	p<0.0125
10-year-olds				U=1172.0
				p<0.0125

Table 4: Mann-Whitney U tests between UK and Chinese age groups for recognizing the advertisements.

	UK-Chinese 6-year-olds	UK-Chinese 8-year-olds	UK-Chinese 10-year-olds	UK-Chinese 12-year-olds
Picture-based advertisements	U=313.0 p<0.025	U=63.0 p<0.025	U=300.5 p<0.025	U=336.5 p<0.025
Text-based advertisements	U=434.0 p>0.025	U=420.0 p>0.025	U=399.5 p>0.025	U=409.5 p>0.025
Total advertisements	U=404.5 p>0.025	U=64.0 p<0.025	U=358.0 p>0.025	U=349.0 p>0.025

could recognize about a quarter of the search engine advertisements, 8-year-olds could recognize about one-third, 10-year-olds could recognize about three quarters and the 12-year-olds could recognize nearly all of the advertisements, close to adult performance levels. The studies were carried out in two countries and with large samples of children. The studies were the first extensive research to consider children's recognition of search engine advertisements, and as discussed below, the broadly consistent pattern of results can be the basis for future research.

Previous research has shown that children can recognize some web advertisements by the age of about 10 years, and can recognize most web advertising by the age of about 12 years [3, 25] so recognising advertisements on search engine pages may be a similar development to recognising advertisements on other web pages. Though we note that in a small sample Li et al. [25] found that UK children did not recognise all search engine advertisements, even at the age of 12 years.

Very young children had little ability to recognize search engine advertising, and it was not until about 12 years of age that children could consistently identify advertisements on search engine pages. Future research could consider children's ability in other countries and with different types of web pages.

Although we took children's Internet weekly usage as a potential

factor affecting children's recognition of search engine advertisements as well as sub-types of advertisements (picture-based/text-based formats) there were no effects for Internet use. This was the case even though UK children spent nearly six times longer on the Internet than did the Chinese children [31]. One possible reason for this difference is that some other activities, such as extra-curricular tutoring, occupy Chinese children's leisure time rather than the use of digital media [53].

As for the different presentation modes of search engine advertisements, we found that 6-, 8- and 10-year-olds showed better recognition of the picture-based advertisements than the text-based advertisements, while no differences were found between the number of correctly recognized picture-based and text-based advertisements by the 12-year-olds. This finding indicates that younger children show an increasing improvement in their information processing of pictures rather than texts, which might be due to their limited literacy skills and well-developed picture-reading abilities in the process of early reading development [35, 50]. At 12 years, an age which has been regarded as reaching adult levels of information processing [8, 54] children have developed good literacy skills and they can focus on and process both picture and text information effectively. Hence, the early reading preference of picture-based information might be because the three younger age groups were better at recognizing picture-based search engine advertisements than text-based search engine advertisements. By 12 years of age children have developed adult-like information process abilities, so they showed no preference and had a higher rate of correctly recognizing the two types of advertisements.

There were differences between the performance of the Chinese children and the UK children. All the age groups of Chinese children were more accurate than the UK children at recognizing picture-based search engine advertising, though there was no difference between Chinese and UK children in recognizing text-based search engine advertising. UK children learning English only need to associate written symbols to spoken language through the alphabetic system of English [51]. But Chinese children can learn Chinese through both an alphabetic system, Pinyin, and also through pictographic cues at the initial language learning stage in primary schools [35, 55]. Therefore, the better performance of the Chinese children in recognizing picture-based search engine advertising might be because Chinese children accumulate more experience in extracting information from pictures than do UK children.

Conclusion and Implications

Advertising to children has been investigated by several researchers [1, 3, 25]. Compared to adults, children are more vulnerable to advertising messages as they have limited cognitive skills, less experience dealing with advertising and have less mature advertising knowledge [7,10]. Researchers have pointed out that children's recognition of advertising is essential for children's understanding of advertising messages [7,10]. Much previous research into children's recognition of advertising has focused on children's recognition of television advertising [7, 10]. Such research shows that children can recognize television advertising by the age of about 5 years.

The two studies in this paper focused on children's recognition of web-based advertisements, specifically advertisements that are found on search engine results pages. The studies were carried out in China (Study 1) and in the UK (Study 2). Children were unable to identify more than half the advertisements on search engine pages until about 10 years of age. The children improved by 12 years of age, but had not quite reached adult levels of recognition even at the latter age.

Children's late ability to recognise advertisements on search engine pages contrasts with their early ability to identify advertisements on television from about 5 years of age.

Web advertising is different from traditional advertising found on television, and its messages are often embedded in the content, which makes those messages harder for children to recognize and distinguish from other online content [3, 25]. According to theories [8,9], children's underdeveloped cognitive skills will limit their ability to distinguish advertising in embedded formats [25].

As more children are going online [26-30] children are increasingly exposed to web advertising. Exposure to advertising raises concerns about the fairness and appropriateness of that advertising [1, 32]. Most regulations about children and media advertising have been influenced by previous findings about television advertising, and as noted above, children have an earlier competence at identifying television advertisements than they do at identifying search engine advertisements. Children's poor performance in recognizing search engine advertisements in the present studies and in recognizing web-based advertisements in previous research [3, 25] suggest that advertising regulations need to take into consideration children's much later awareness of web-based advertising (see below). Even young children use search engines frequently [36] and so they may be susceptible to seeing images and texts that they do not realize are advertisements.

The studies in this paper also investigated the effect of advertising presentation mode, picture-based or text-based, on children's recognition of search engine advertising. Researchers have argued that using pictures as a presentation mode is more attractive to children and facilitates better learning and comprehension than using a text-based presentation mode [33,35]. However, there was no evidence from the results of Studies 1 to 2 to support the suggestion that children were better at recognising picture-based advertisements than text-based advertisements. The results of Study 2 indicated that Chinese children were better than UK children at recognizing picture-based advertisements. This result could be due to Chinese children's greater experience of learning pictographic representations of Chinese words [55] which might facilitate Chinese children's ability to extract and process picture-based information on a search engine page.

The findings from the three studies reported in this paper have implications for regulations. Contemporary children are exposed to an increasing amount of advertising including embedded advertising formats [10, 56]. In response to this issue, some governments and organizations in western countries have focused on television advertising that is aimed at children [11, 12].

There is still a lack of regulation to protect children from new interactive and embedded advertising formats. Findings from the present studies suggest that age and different language systems can affect children's processing of picture and text information, and can affect children's awareness of search engine advertising. Therefore, advertisers should consider ways, such as adding explicit labels to text and pictures, to make children aware that what they are seeing on a web page is an advertisement. Future research could consider the most effective ways to warn children about advertising.

Advertisers are aware of children's susceptibility to advertising effects, but they still consider children's awareness of advertising in relation to the empirical evidence from television advertising recognition [57]. The findings from the present studies suggest that governments and advertisers should be more aware that children's

ability to recognize search engine advertising develops several years later than their ability to recognize television advertising. Educating parents and teachers about the nature of online advertising and informing parents and teachers about children's lack of awareness about online messages would also be important.

Recommendations for Future Research

There are several directions that future research could consider. First, television-based studies indicate that television advertising still has an effect on children even when they are too young to recognize the advertising [58, 59] so future researchers could investigate whether unrecognized search engine advertisements have an effect on children. Based on the previous research into the effects of television advertising on children, there may well be an effect of search engine advertising even when children are too young to recognize the advertisements. If so, this would raise issues about influencing children who are unable to realise that they are seeing a biased message (i.e., an advertisement) when they look at a search engine page.

Second, future research could explore how children identify the search engine advertising, by considering what cues they reply on. Li et al. [25] found that children and adults differed in how they identified advertisements on web pages. There may well be differences in how children and adults distinguish advertisements on search engine pages.

Third, we have found in all the studies in this paper that children's recognition of search engine advertising lags behind their recognition of advertisements in other media, like television. Children may therefore need help in recognising such web-based advertisements. Advertising literacy programmes can improve children's awareness of television advertising [22, 60]. Future research could investigate whether similar advertising literacy programmes could be developed to help young children to better recognise the advertisements they see when they carry out searches on the web.

In summary, these studies have shown children's ability to recognize search engine advertising develops several years later than their ability to recognize television advertising, which has implications for governments, parents and educators. There is a need for further research into children's understanding of non-television advertising, and that research could inform future guidelines and regulations.

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References

1. De Jans S, Van de Sompel D, Hudders L, Cauberghe V (2019) Advertising targeting young children: An overview of 10 years of research (2006–2016). Inter J Adver 38: 173-206.

2. Lati I, Hamid M, Abrar M, & Ali M. (2017) Influence of Advertising, Parent power, Environment and Kids buying behavior on Pester Power. Global Journal of Research in Business & Management 6: 469-476.

3. Ali M, Blades M, Oates C and Blumberg F (2009) Young children's ability to recognize advertisements in web page designs. Br J Dev Psychol 27: 71-83.

4. An S, Jin H S and Park EH (2014) Children's advertising literacy for advergames: Perception of the game as advertising. J Adver 43: 63-72.

5. Desrochers DM (2015) M Book review: Advertising to children in traditional and new Media. J Child Media 9: 272-275.

6. Hudders L, De Pauw P, Cauberghe V, Panic K, Zarouali B, et al. (2017). Shedding new light on how advertising literacy can affect children's processing of embedded advertising formats: a future research agenda. J Advert 46: 333-349.

7. Rozendaal E, Buijzen M and Valkenburg P (2010) Comparing children's and adults' cognitive advertising competences in the Netherlands. J Child Media 4: 77-89.

8. John DR (1999) Consumer socialization of children: A retrospective look at twenty-five years of research. J Con Res 26: 183-213.

9. Rozendaal E, Buijzen M and Valkenburg P (2010) Comparing children's and adults' cognitive advertising competences in the Netherlands. J Child Media 4:77-89.

10. Kunkel D, Wilcox BL, Cantor J, Palmer E, Linn S, et al. (2004) Report of the APA task force on advertising and children. Washington, District of Columbia. American Psychological Association 2-10.

11. Children's Advertising Review Unit (2014) Self-regulatory program for children's advertising revised. New York: Council of Better Business Bureaus.

12. European Commission (2016). Unfair commercial practice directive.

13. Committee of Advertising Practice (2017) Recognition of advertising: Online marketing to children under 12. CAP.

14. Chan K (2000) Hong Kong children's understanding of television advertising. J Mark Commun 6: 37-52.

15. UNICEF China (2018) Chapter 1: Population demographics.

16. Yang J (2008) The effective functioning of the children's TV advertising regulation (in Chinese). Journalism

17. Lover 12:108-109.

18. Chan K and McNeal JU (2002) Children's perceptions of television advertising in urban China. Young Consumers 3: 69-79.

19. Gao Z and Kim S (2009) Chapter 6: Advertising law and regulation in China. In H. Cheng & K. Chan (Eds.) Advertising and Chinese society: Impacts and issues. Denmark: Copenhagen Business School Press 143-157.

20. State Administration of Industry and Commerce (2019) Over 0.7 billion yuan has been fined for illegal advertising in 2018 (in Chinese).

21. Opree SJ, Petrova S and Rozendaal E (2020) Investigating the unintended effects of television advertising among children in former-Soviet Bulgaria. J Child Media 14: 141-157.

22. Stephens N, Stutts MA, Burdick R (1982) Preschoolers' ability to distinguish between television programming and commercials. J Advert 11:16-26.

23. https://www.routledge.com/Advertising-to-Children-on-TV-Content-Impact-and-Regulation/Gunter-Oates-Blades/p/book/9780805858303

24. Carter OB, Patterson LJ, Donovan RJ, Ewing MT, Roberts CM (2011) Children understands of the selling versus persuasive intent of junk food advertising: Implications for regulation. Soc Sci Med 72:962-968.

25. Chan K, McNeal JU (2006) Children and media in China: An urban-rural comparison study. J Consum Mark 23:77-86.

26. Li S, Pickering M, Ali M, Blades M, Oates C (2014) Young children's ability to identify advertisements on television, Web pages and search engine Web pages. Advertising to children 199-217.

27. https://www.cnnic.com.cn/IDR/ReportDownloads/201807/P020180711391069195909.pdf

28. https://www.cnnic.com.cn/IDR/ReportDownloads/201911/P020191112539794960687.pdf

29. https://www.commonsensemedia.org/research/the-common-sense-census-media-use-by-kids-age-zero-to-eight-2017.

30. https://www.ofcom.org.uk/research-and-data/media-literacy-research/childrens/children-parents-2017

31. https://www.ofcom.org.uk/research-and-data/media-literacy-research/childrens/children-and-parents-media-use-and-attitudes-report-2018 .

32. https://www.ofcom.org.uk/research-and-data/media-literacy-research/childrens/children-and-parents-media-use-and-attitudes-report-2019 .

33. Hudders L, De Pauw P, Cauberghe V, Panic K, Zarouali B, et al. (2017) Shedding new light on how advertising literacy can affect children's processing of embedded advertising formats: a future research agenda. J Advert 46:333-349.

34. Houts PS, Doak CC, Doak LG, Loscalzo MJ (2006) The role of pictures in improving health communication: a review of research on attention, comprehension, recall, and adherence. Patient Educ Couns 61:173-190.

35. Pieters R, Wedel M (2004) Attention capture and transfer in advertising: Brand, pictorial, and text-size effects. J Mark 68: 36-50.

36. Zhou J, Liu BG (2010) From image to text: the early childhood reading and literacy development of Chinese speaking children. Chinese J Rehabilitation 12: 64-71.

37. Iwata M, Arase Y, Hara T, Nishio S (2010) A children-oriented re-ranking method for Web search engines. International Conference on Web Information Systems Engineering Springer 225-239.

38. Lapierre MA, Rozendaal E (2018) Cross-national differences in consumer socialization, development, and behavior: A comparison of children in the United States and the Netherlands. J Child Media 12:388-405.

39. Broadcast Committee of Advertising Practice (2010) The BCAP Code: The UK Code of Broadcast Advertising Stationery Office.

40. Li J (2011) Research on regulations about product placement. Jurists Review 62-73.

41. Li B (2017) A major difference between the formation of English words and the formation of Chinese words in modern times. JLTR 8:1050-1054.

42. Castles A, Rastle K, Nation K (2018) Ending the reading wars: Reading acquisition from novice to expert. Psychol Sci Public Interest 19:5-51.

43. Broadcasters Audience Research Board (2019) Television ownership in private domestic households 1956-2018.

44. Office for National Statistics (2019) Families and households: 2018. Office of National Statistics.

45. China Statistics Press (2018) China Statistical Yearbook 2018. National Bureau of Statistics of China.

46. China Internet Watch (2019) China Internet users snapshot 2019.

47. Statista (2019) Share of households with Internet access in the United Kingdom (UK) from 1998 to 2018.

48. Broadcast Committee of Advertising Practice (2010) The BCAP Code: The UK Code of Broadcast Advertising. Stationery Office.

49. Committee of Advertising Practice (2010) The CAP Code: The UK Code of Non-broadcast Advertising, Sales Promotion and Direct Marketing. Stationery Office.

50. Swanson LA, Lauren A (1990) Advertising in China: Viability and structure. Asia Pacific J Mark Logist 2:19-31.

51. Evans MA, Saint-Aubin J (2010) An eye for print: Child and adult attention to print during shared book reading. In Literacy development and enhancement across orthographies and cultures Springer, Boston, MA 43-53.

52. Brysbaert M, Stevens M, Mandera P and Keuleers E (2016) How many words do we know? Practical estimates of vocabulary size dependent on word definition, the degree of language input and the participant's age. Front Psychol 7: 1116.

53. Chen HC and Tang CK (1998) The effective visual field in reading Chinese. In Cognitive processing of the Chinese and the Japanese language. Springer 91-100.

54. China National Children Center (2019) Blue book for children: Annual Report on Chinese Children's Development (in Chinese). Social Science Academic Press (China), Beijing.

55. Buijzen M, van Reijmersdal EA and Owen LH (2010) Introducing the PCMC model: An investigative framework for young people's processing of commercialized media content. Communication Theory 20: 427-450.

56. Chang LY, Chen YC and Perfetti CA (2018) GraphCom: A multidimensional measure of graphic complexity applied to 131 written languages. Behav Res Methods 50: 427-449.

57. Rozendaal E, Buijzen M and Valkenburg P (2011) Children's understanding of advertisers' persuasive tactics. Int J Advert 30: 329-350.

58. Daems K, De Pelsmacker P and Moons I (2019) Advertisers' perceptions regarding the ethical appropriateness of new advertising formats aimed at minors. J Mark Commun 25: 438-456.

59. Miller SA, Taveras EM, Rifas-Shiman SL, Gillman MW (2008) Association between television viewing and poor diet quality in young children. Int J Paediatric Obesity 3: 168-176.

60. Zimmerman FJ and Bell JF (2010) Associations of television content type and obesity in children. Am J Public Health 100: 334-340.

61. Eagle L (2007) Commercial media literacy: what does it do, to whom - and does it matter? J Advertising 36: 101-110.