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IAFOR Journal of Psychology & the Behavioral Sciences

Volume 8 – Issue 1 – Spring 2022

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Volume 8 – Issue 1 – 2022

Editors' Note:

We are happy to present to you the 2022's Spring issue of our journal. The *IAFOR's Journal* of *Psychology & the Behavioral Sciences* covers a variety of empirical studies about applications of psychological theories in educational and mental health settings. Moreover, the journal showcases studies that investigate topics regarding human development, psychological outreach services, family studies, as well as articles addressing the needs of at-risk children, youth and families, and vulnerable populations.

The *IAFOR Journal of Psychology & the Behavioral Sciences* is a peer-reviewed, editorially independent, and an interdisciplinary journal associated with the IAFOR (The International Academic Forum) conferences on Psychology and the Behavioral Sciences. This issue is devoted to several interdisciplinary studies which represent diverse topics, cultures, and disciplines in the fields of psychology and the behavioral sciences. All manuscripts published in the journal have been subjected to the thorough and accepted processes of academic peer review. Some of the articles are original, and some are significantly revised versions of previously presented papers or published reports in the IAFOR's conferences and proceedings.

We want to express our sincere appreciation to all reviewers for taking time from their busy schedules to review each assigned manuscript and offer their professional expertise and recommendations for improvement of these published articles. Also, we like to take this opportunity to acknowledge the hard work of our support staffs at the IAFOR who were involved with the publication of this journal.

Please note that we are seeking manuscripts for our upcoming 2022 and 2023 issue.s Below is the link to the journal's web page for your attention; please review this web page to become familiar with the journal's objectives and the submission guidelines for authors:

http://iafor.org/publications/iafor-journals/iafor-journal-of-psychology-and-the-behavioral-sciences/

If you have any questions, please do not hesitate to contact us, otherwise please send your manuscript to the journal's editors below. Thank you for considering this invitation, and we look forward to hearing from you soon. Best Regards, Journal Editors

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Article 1: Effects of Visual Metaphors on Enhancing the Power of Advertisements

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Hiroaki Nakamura received his MA degree from Kobe City University of Foreign Studies and also studied in the doctoral program of the Graduate School of Literature at Kyoto University, Japan. He is currently a Professor at Nagoya University of Economics. He has written books and articles on formal logic and language learning. He has also received funding from the Japan Society for the Promotion of Science to research metaphor in Japanese and English.

Article 2:

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Dr Ryo Ishii is an associate professor of psychology at Nara University of Education. His research interests focus on developmental, educational, and clinical psychology. Recently he has been engaged in research on the mechanisms of suicide and its prevention based on socioeconomic status and early childhood development. He received a PhD in Psychology for his study of time perspective and identity formation. He is also a clinical psychologist and has worked extensively at a public health center, an online counseling service, and so on. In addition, he is engaged in efforts to foster mother-child relationships as a COSP (Circle of Security Parenting) facilitator.

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Dr Tomoko Obara is a professor of psychology at Ohkagakuen University. Her research interests focus mainly on developmental and clinical psychology, especially the development of maternal cognition of infant emotions. Recently she has been working to elucidate the process of acquiring emotional cognition in caregivers and to develop proficiency programs for caregivers. After working for a Japanese cosmetics company, she entered graduate school and completed her doctoral degree. In addition to educational and research activities at the university, she has worked at a clinic as a clinical psychologist and has conducted multiple

training sessions for preschool teachers. She offers strong parenting support as a researcher, an educator, and a practitioner.

Article 3:

Online Health Information Seeking Behavior and Thriving Quotient in the COVID-19 Pandemic: The Mediating Role of Mental Toughness

Dr Rhalf Jayson Guanco is a psychologist who inspires individuals to attain their greatest potential by integrating his faith, educational training, and clinical and life experiences. He is currently employed as an assistant professor at the Adventist University of the Philippines' psychology department, where he teaches major courses. Dr. Guanco is globally recognized for improving society and benefiting the lives of many. He is committed to practicing evidence-based psychology and has traveled to various countries in Southeast Asia to advocate for sound mental health, provide mental health consultations and workshops, and train willing volunteers in mental health awareness. He works with children, adolescents, and adults experiencing neurocognitive problems, developmental concerns, behavioral difficulties, depression, anxiety, or other mood disorders, as well as a variety of other conditions that may require clinical attention, such as academic difficulties and family difficulties, or adjustment concerns. **Email:** rhalfjayson02guanco@gmail.com

Article 4:

Comparative Study of Realistic Optimism between India and Japan University Students

Dr Aneesah Nishaat, from India, completed a PhD from Japan's Soka University. Currently an Assistant Professor at the Department of Education, Soka University, Aneesah Nishaat's research is related to positive psychology, mainly focused on optimism, and well-being. Dr Nishaat is also interested in the comparative study of various aspects of positive psychology between India and Japan.

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Effects of Visual Metaphors on Enhancing the Power of Advertisements

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Abstract

Visual metaphors deliberately deviate from the literal representation of an object. The resulting incongruity has the potential to be more engaging and memorable for the viewer and thus are frequently used as a design feature in advertisements. Recently, researchers have begun to more thoroughly examine the advantages that visual metaphors play in advertisements and this study contributes to this growing body of research. Two experiments were conducted using sets of paired advertisements for the same product or social awareness campaign based on one of them being a visual metaphor and the other being a visual non-metaphor to explore if there was a *visual-metaphor effect*. In Experiment 1, participants rated these adverts based on three criteria, effectiveness, engagement, and a metaphorical framing effect along with an open-ended question. In Experiment 2, two additional variables were included, comprehensibility and creativity. Results support the view that visual metaphors tend to be more engaging and perceived to be more creative. However, this does not always result in them being viewed as more effective adverts.

Keywords: advertisements, creativity, engagement, framing effect, visual metaphor

In 2016, a visual metaphor for the World Wildlife Federation social awareness campaign won a best advertising award¹. In the image, the designers blended a game of Jenga with the ecosystem, so each Jenga piece represents some part of the ecosystem. Understanding the ecosystem is rather complex and abstract, but many people know that the game of Jenga is based on balance and removing each piece slightly disrupts this balance before the structure eventually collapses. Viewing the ecosystem as a game of Jenga is a powerful way to help people better understand the fragility of it. Visual metaphors like this one have the potential to be more pleasing than non-visual equivalents for it requires the viewer to resolve the conceptual deviance within the metaphor. This stimulates interest in the viewer and requires additional cognitive effort, which has the potential to be a rewarding experience (see Jeong, 2008). Previous research has shown that visual metaphors have a positive effect on consumers by capturing the viewers' attention and increasing the persuasiveness of the advert (Kitchen 2008; McQuarrie & Mick 2003; McQuarrie & Phillips 2005). Thus, advertisements and social awareness campaigns often use visual metaphors as a way to engage, make the campaign message more memorable, and persuade the viewer to the intended interpretation (e.g., we must act soon to protect the environment before the entire ecosystem collapses). The wide spread use of metaphors in advertisements has resulted in an increase amount of interest into this topic (see Pérez-Sobrino, 2017) and this study contributes to this growing body of research. This study investigates visual advertisements by using an innovative method that pairs visual metaphors in advertisements by contrasting them with equivalent visual non-metaphor adverts. In Experiment 1, we explore whether there was a visual metaphor advantage on three measurements; engagement, effectiveness and a metaphorical framing effect. In Experiment 2, we expand these variables to include two additional ones; comprehensibility and creativity.

Theoretical Framework

The theoretical framework of this study is grounded in Conceptual Metaphor Theory (Gibbs, 2011; Lakoff, 1987; Lakoff & Johnson, 1980; Lakoff & Johnson, 1999), which argues that metaphor is not only a linguistic device, but in fact, is conceptual in nature, as in, we think in metaphor. So, metaphorical expressions like to "come clean" or a "mudslinging campaign" are not simply linguistic, but there is an underlying conceptual structure that motivates them (e.g., MORALITY IS CLEANLINESS). Thus, at the conceptual level and possibly neuronal level (Gallese & Lakoff, 2005), we fuse these concepts together and this allows us to easily understand metaphorical expressions in language. Furthermore, if metaphors are conceptual in nature, then they will also appear in other modes of communication like images.

Metaphors in Images

Linguistic metaphors are often ontological in which an abstract concept is represented or grounded in something concrete (Lakoff & Johnson, 1980). On the other hand, visual metaphors² often use two concrete objects in which (a) the topic and source are blended together; (b) the source replaces the topic in the image; or (c) the topic replaces the source (Forceville, 1996; Forceville & Urios-Aparisi, 2009). For instance, an example of (a), an advertisement for Toyo tires blends together car tires with the legs of an octopus to highlight the gripping power of these tires (see Figure 1A). An example of (b) is an advert by BMW,

¹ See https://www.bestadsontv.com/ad/79549/wwf-Green

 $^{^{2}}$ In the literature both visual and pictorial metaphors are frequently used, we will use only the term "visual metaphors" to describe metaphors that use images and contrast this with "visual non-metaphors", or images that are used in the literal sense.

which shows a cheetah with glowing eyes like the headlamps of a car, but the car is not present, but must be inferred from the context, namely the logo. One likely maps the fast, sleek, and graceful movements of this animal with its nocturnal vision onto a BMW car. For an example of (c), Forceville (1996, pp. 110-113) shows an advert for a pair of shoes. One shoe is contextually placed where a tie is usually worn. This highlights the aesthetic beauty of these shoes. That is to say, they are so pleasing they could be worn in the most prominent place on the body. The world of advertising exploits the use of metaphors as a way to emphasize certain semantic features of their products. So, after viewing the BMW advert, the viewer has semantically mapped certain semantic features of a cheetah onto the car (e.g., sleekness, speed, etc.). It has been shown in a number of studies that visual metaphors have the power to enhance appreciation of the product (McQuarrie & Mick, 1999; McQuarrie & Mick, 2003; Phillips & McQuarrie, 2009) and this could be described as a *visual-metaphor effect* in advertising. Figures of speech like metaphors are a common design and style feature in advertisements. For example, Leigh (1994) in a large sampling of print adverts found 75% of the headlines used some form of figure of speech, particularly word play and metaphor.

Aesthetic Preference in Advertisements: Being Engaged and Perceived Effectiveness

A primary goal of an advertisement is to attract the attention of the viewers by engaging them with the image and text and for them to find some pleasure in this experience. Engagement is a complicated term and is not widely agreed upon among researchers, but typically it refers to when the viewer has an intrinsic enjoyable experience (Calder et al., 2009). This pleasure results in the attention of the viewer becoming involved in the advertisement or what Wang (2006) has described as being "turned on" to "a brand idea enhanced by the surrounding context" (p. 356). One variable to enhance the surrounding context is to use a visual metaphor since metaphor is a common cognitive tool for creativity (see Birdsell, 2018) and creative adverts have been shown to attract the attention of the viewer (Pieters et al., 2002; Smith et al., 2007). In this view, the artful deviation of the rhetorical figure (e.g., metaphor) in an advertisement adds interest to the image (McQuarrie & Mick, 1999; Phillips & McQuarrie, 2009), resulting in a direct relationship between cognitive effort and aesthetic appreciation (see Berlyne, 1971; Miall & Kuiken, 1994; van Mulken, Dijk, & Hoeken, 2005). In one study that looked specifically at aesthetic preference in language, participants evaluated nonconventional or novel variants of metaphor as being more aesthetically pleasing as compared to conventional variants despite the fact that they also had an enhanced cognitive cost for comprehension (Wimmer, Christmann, & Ihmels, 2016). This has important implications for research into visual metaphors, which tend to require greater cognitive resources to comprehend. However, there are conflicting theories in how one assesses pleasure from stimuli like language, images, or objects. Another side argues that the stimuli that can be processed most fluently are rated as most pleasurable (see Reber, Schwarz, & Winkielman, 2004; Zajonc, 2001) and thus the added cognitive load of processing a visual metaphor may in fact reduce the enjoyment of the viewing experience. Moreover, McQuarrie and Mick (1999) showed that the positive effect of a visual trope (such as metaphor) diminished for viewers who lacked the cultural competency to appreciate the adverts, suggesting that other factors may play a role in effectively engaging the viewer to the advert. Thus, there is still a considerable amount of uncertainty to whether visual metaphors have a positive effect of engaging the viewer to the advertisement.

As engagement looks at how much the viewer is involved and "turned on" by the advertisement, effectiveness, on the other hand, is the overall evaluation the viewer has of the advert. Again, research (Smith et al., 2008) with creative adverts has shown them to be

favorably evaluated and thus more effective than low creativity adverts. Taken together, this hints to the possibility that advertisements that use visual metaphors will be evaluated as being more engaging and effective, yet this still needs to be further explored. So, our first research question asks the following:

(1) Are visual metaphors in advertisements, compared to paired non-metaphorical equivalents, rated as being more engaging and effective by the participants, despite the added cognitive cost to comprehend them?

Metaphorical Framing Effect

Metaphors allows us to see one thing in terms of another and this has the power to influence an individual's understanding and evaluation of a given topic. This is referred to as a metaphorical framing effect. For instance, the topic "crime" can be metaphorically framed as a "virus" or a "beast" and this has an influence on how the individual chooses a proposed countermeasure for this problem. In text that presented this problem as a "virus", participants more likely chose to increase support for social reform and when it was presented as a "beast", they more likely chose a counter-measure for increasing police enforcement (Thibodeau & Boroditsky, 2011, 2013). In regard to visual metaphors in advertisements, advertisers often select a source to include in the advert that highlights a semantic feature of the topic (that is to say, the product of the ad). For example, Toyo uses an octopus in the advert (see Figure 1A), as a way to highlight the gripping power of the tires. In another example, a hammock (the source) hangs between two ballpoint pens (the topic/product), which suggests the following interpretation, "writing with this ballpoint pen is as comfortable as relaxing in a hammock". So, in this example, it raises the question, does this metaphorical frame have an effect on how the participant conceives the product (the pen)? In other words, would a viewer rate the pen in the metaphor advert as being more comfortable to write with, as compared to a non-metaphor advert for the same pen. To assess the metaphorical frame, the researchers first identified the source in the visual metaphor, then came to a consensus as to the semantic feature(s) that it aimed to exploit, and finally came up with a unique question that assessed this metaphorical frame. For example, for the Toyo tires add, the source is "octopus tentacles", the intended semantic feature is "gripping power", and the metaphorical framing question we used is, "Do you think you can drive well in the rain with these tires?". So, our second research question asks the following:

(2) Do visual metaphors have a metaphorical framing effect compared to paired nonmetaphorical equivalents?

The Present Study

Experiment 1

Participants

Seventy-nine students at a Japanese university took part in this study (53 female, $M_{age} = 19.5$). Participants were paid remuneration, as set by the university. These participants were randomly divided into two groups.

Materials and Procedure

The material consisted of product or social awareness campaign advertisements. We first selected these by searching for visual metaphors for advertisements online that all three researchers confirmed were metaphorical (as in, had a clear topic and source that all agreed upon). Then, we searched online for the same product in a non-metaphorical advertisement. In the end, we compiled 14 paired advertisements that had two differing conditions; metaphorical and non-metaphorical, so in total, there were 28 images (see Figure 1 as an example for a paired set of adverts)³.

Figure 1

Paired-Advertisement for Toyo Car Tires



Note. Panel A: Metaphorical advert (in Form1) Credit: Advertising Agency: GMASCO, Dubai, UAE; Creative Director: Khalid Radwan. Source: https://www.adsoftheworld.com/media/print/toyo_octopus. Panel B: Non-metaphorical advert (in Form 2) Credit: https://toyotires.com

We then created two online forms. Form 1 had seven metaphorical and seven non-metaphorical advertisements and was completed by Group 1 (n = 40). Form 2 had the other pairs, respectively, and was completed by Group 2 (n = 39). A set of questions based on a 6-point Likert-scale ranging from 1 ("I strongly do not think so") to 6 ("I strongly think so") accompanied each advertisement. Two questions asked the following; the level of effectiveness "Is this advert effective?" and engagement "Is this advert engaging?" and these questions were consistent throughout all the paired advertisements. In addition, each paired advertisement also had a unique question(s) based on the metaphorical frame. Finally, all paired sets had a final question. This question was an open-ended question that asked the participants to input the first thing that came to their mind when they viewed the advert. These questions and all materials in this study were presented to the participants in Japanese.

As for the procedure, student participants joined an online virtual session, administered by two of the researchers and were informed about the study. Then, they provided consent and proceeded to open either Form 1 or Form 2 depending on their group. They had roughly 30 minutes to complete the form.

³ The complete sets of paired-advertisements used in this study are not included in this paper, but to ensure reproducibility, the materials are available on the following website: https://bbirdsell.wixsite.com/index/research

Results

A one-way analysis of variance (ANOVA) was calculated to compare the effect of visual metaphors on effectiveness (EFF), engagement (ENG), and metaphorical framing (MF) for each paired-advertisement. Results from the analysis of variance indicate that the visual metaphor condition showed significance for at least one of the before mentioned three measures for 11 of the 14 adverts (see Table 1). The Heinz ketchup and Floslek sunscreen advertisements showed significance for all three measurements with medium to large effect sizes; ketchup effectiveness, F(1,78) = 7.18, p = .009, ketchup engagement F(1,78) = 15.57, p = .000, and ketchup metaphorical framing F(1,78) = 44.51, p = .000. As for other examples from this pool of advertisements, participants who viewed the visual metaphor advert for Nestle coffee compared to the participants who viewed the non-metaphor coffee advert rated significantly higher level of engagement, F(1,78) = 6.76, p = .011, but not on the other two scales (effectiveness and metaphorical framing). In another example, the visual metaphor for Toyo car tires advert showed a large effect for one metaphorical frame (driving in the rain) F(1,78) = 20.52, p = .000, but not for the second one (safety of the tires) F(1,78) = 2.57, p = .000.113. In sum, engagement was the most common strength of the visual metaphor adverts showing significance for 9 of the 14 total adverts, effectiveness and metaphorical framing showed fewer cases of significance (4 and 6, respectively).

Table 1

Means, Standard Deviations, and One-Way Analyses of Variance in Metaphor and Nonmetaphor Visual Advertisements for Experiment 1

Variable	Metaphor		Non-metaphor		ANOVA		
-	M	SD	М	SD	F (1, 78)	η^2	
Cello Ballpoin	t Pen						
EFF	3.48	1.22	3.62	1.23	0.26	.00	
ENG	4.13	1.40	3.49	1.41	4.07^{*}	.05	
MF	3.38	1.37	2.97	1.18	1.93	.02	
Tabasco Hot S	auce						
EFF	4.43	1.41	3.49	1.39	8.83**	.10	
ENG	5.00	1.36	3.15	1.09	44.26***	.37	
MF	4.38	1.64	4.15	1.27	0.45	.01	
Nestle Coffee							
EFF	4.68	1.27	4.54	1.00	0.28	.00	
ENG	5.10	1.08	4.41	1.27	6.76^{*}	.08	
MF	3.90	1.78	3.15	1.60	3.84	.05	
Heinz Ketchup)						
EFF	5.13	1.02	4.49	1.10	7.18^{**}	.09	
ENG	5.33	0.94	4.31	1.32	15.57***	.17	
MF	5.35	0.98	3.41	1.55	44.51***	.37	
Fry Light Cooking Oil							
EFF	3.88	1.40	4.41	1.27	3.16	.04	
ENG	4.53	1.24	4.67	1.13	0.28	.00	
MF	4.28	1.54	4.54	1.35	0.65	.01	
Oxipoder Shirt Cleaner							
EFF	5.38	0.84	5.05	0.92	2.69	.03	
ENG	5.23	1.00	4.51	1.17	8.50^{**}	.01	
MF	5.68	0.57	5.08	1.29	7.20^{**}	.09	

11

Variable	Metaphor		Non-metaphor		ANOVA			
	М	SD	M	SD	F (1, 78)	η^2		
Toyo Car Tires								
EFF	4.54	1.35	4.50	1.18	0.41	.01		
ENG	4.03	1.46	4.73	1.20	5.43*	.07		
MF1	4.54	1.39	3.13	1.38	20.52^{***}	.21		
MF2	3.49	1.54	3.98	1.14	2.57	.03		
Anti-smoking Campaign								
EFF	4.68	1.49	4.62	1.41	0.03	.00		
ENG	4.70	1.52	3.69	1.30	9.98**	.11		
MF	4.73	1.50	4.00	1.52	4.54^{*}	.06		
New Balance Ru	inning Shoes	5						
EFF	4.36	1.25	4.85	1.00	3.74	.05		
ENG	4.79	1.20	4.73	1.01	0.08	.00		
MF	3.38	1.71	2.83	1.47	2.44	.03		
Australian Posta	l Service							
EFF	4.56	1.37	3.45	1.26	14.14^{***}	.16		
ENG	4.51	1.52	4.03	1.40	2.20	.03		
MF	4.38	1.62	3.90	1.78	1.60	.02		
Floslek Sunscree	en							
EFF	5.56	0.85	4.90	0.96	10.61**	.12		
ENG	5.56	0.79	4.60	1.19	17.85***	.19		
MF	5.38	0.67	4.63	1.21	11.76**	.13		
WWF Protect th	e Forest							
EFF	5.51	0.68	5.23	1.00	2.22	.03		
ENG	5.26	1.12	4.38	1.55	8.39**	.10		
MF	5.44	1.21	4.88	1.34	3.80	.05		
Defend Press Freedom								
EFF	4.13	1.38	4.05	1.45	0.06	.00		
ENG	4.13	1.59	3.78	1.37	1.12	.01		
MF	4.38	1.71	3.85	1.59	2.07	.03		
VW Van	VW Van							
EFF	3.08	1.49	3.20	1.45	0.14	.00		
ENG	3.28	1.45	2.90	1.41	1.41	.02		
MF1	2.90	1.41	2.68	1.31	0.14	.00		
MF2	4.97	1.06	4.05	1.50	9.93**	.11		

Note. N = 79. EFF = effectiveness; ENG = engagement; MF = metaphorical framing.

*p < .05. **p < .01. *** p < .001.

In regards, to the open-ended question that asked them to input their immediate reaction to the advertisement, we first translated the responses from Japanese into English by two native Japanese speakers and one native English speaker. Then, we categorized the responses based on the following: topic, as in, referencing the product of the advert, source, as in, referencing the source in the metaphor, property, as in, referencing some inherent feature of the source or topic, positive valence, as in, evaluating the advert in a favorable way, negative valence, and other. Figure 2 shows the contrasting responses from the participants for the Toyo car tires paired-advertisements. This is one of the metaphor adverts that showed a significant difference for the metaphorical frame 1 (driving well in rainy weather), but not for metaphorical frame 2 (safety). Responses to the open-ended question highlights the fact that a number of participants (28%) in the metaphor condition focused on the source property of the octopus (gripping

power) and this likely influenced their assessment of the tires ability to drive well in the rain, but not the more general metaphorical frame concerning safety. As expected, the participants in the non-metaphor condition primarily focused on the topic of the advert, the tires and car, and also the apparent "toughness" of the tires. Despite the responses to this open-ended question showing a higher percentage of positive evaluation to the non-metaphor advert (28%) compared to the metaphor advert (18%), the latter still showed a significant difference for engagement.

Figure 2





Note. Panel A: Metaphorical advert. Panel B: Non-metaphorical advert.

In another analysis for the open-ended question, we had to include a number of other categories for the responses to the Cello ballpoint pen advert. One additional category is named misunderstanding, which is when the viewer experienced a cognitive break down in the interpretation of the advert. For example, one participant thought the hammock in the metaphorical ballpoint pen advert was a net and even included a question mark to highlight his/her confusion. Another category is called company, for when the viewer focused primarily on some connection to the company. Finally, some viewers made a connection to another semantic field and therefore we called this category association. For example, one participant connected the non-metaphorical ballpoint pen advert to toothpaste and another to America. Figure 3 shows the results. First, many respondents in the visual metaphor condition focused on the source concept, the hammock (25%), and also positively evaluated the advert (17%). On the other hand, 15% showed a misunderstanding of the metaphor, writing "net?" or "difficult to see". As for the non-metaphor advert, participants focused on the topic and topic properties, as expected, but also the company logo and name (15%) and some made associations to work or even more abstrusely to toothpaste, compared to the metaphor group.



Figure 3: Paired-advertisement for Cello Ballpoint Pen Open-Ended Question

Note. Panel A: Metaphorical advert. Panel B: Non-metaphorical advert.

One limitation of this experiment is that we did not collect data from these participants on a variable that examines the difficulty of interpretation for these adverts or the comprehensibility of them. This would have provided additional insight into why some visual metaphor adverts did not show a *visual-metaphor effect* for engagement. Collecting this additional variable, one then could examine more closely whether the degree of difficulty of comprehending the visual metaphor has an inverse relationship with engagement. In addition, the adverts used in this study were not adverts originating in Japan and therefore the effect culture has on visual metaphors also needs to be considered. In a recent study (Pérez-Sobrino et al., 2019) researchers investigated processing time, appreciation, and interpretation of creative multimodal adverts with participants from various cultural and linguistic backgrounds. Results from their data indicate considerable cross-cultural variation among the participants. To which the researchers suggest, "(I)n some cases, the participants misunderstood the main message of the advertisement, and this appeared to affect their levels of appreciation and perceived effectiveness" (p. 986). So, taking these points into consideration, we conducted a second experiment. As a result, three additional research questions were included in this second study:

- (1) Are visual metaphors rated as being more creative than paired non-metaphorical equivalents?
- (2) Are visual metaphors more difficult to comprehend?
- (3) Are foreign advertisements more difficult to comprehend than non-foreign (Japanese) advertisements?

Experiment 2

Participants

Seventy-five students at a Japanese university took part in this study (51 female, $M_{age} = 18.6$). Participants were paid remuneration, as set by the university. These participants were randomly divided into two groups.

Materials and Procedure

Similar to Experiment 1, the material consisted of advertisements and a set of questions accompanying each advert. To modify some of the shortcomings from Experiment 1, we included Japanese adverts into the list and removed the social awareness campaign items. So, in total there were 15 paired items: 10 foreign adverts and 5 Japanese adverts. Form 1 had eight metaphorical and seven non-metaphorical advertisements and was completed by Group 1 (n = 38). Form 2 had the other pairs, respectively, and was completed by Group 2 (n = 37). The accompanying questions were similar to Experiment 1, but in Experiment 2, we included two additional items; the level of comprehensibility of it "Is this advert easy to understand?" and level of creativity "Is this advert creative?" Furthermore, after interviewing student participants from Experiment 1, who expressed difficulty in selecting scores based on a 6-point scale, we reduced the scale to a 4-point Likert-scale, ranging from 1 ("I strongly do not think so") to 4 ("I strongly think so"). The procedure was the same as Experiment 1.

Results

A one-way analysis of variance (ANOVA) was calculated to compare the effect of visual metaphors on effectiveness (EFF), engagement (ENG), metaphorical framing (MF), comprehensibility (COMP), and creativity (CR) for each paired-advertisement. Results from the analysis of variance indicate that the visual metaphor condition showed significance with medium to large effect size for creativity for all the adverts in this pool, except for the Toshiba semiconductor advert; ranging in strength from the Oxipoder shirt cleaner advert F(1, 74) =12.99, p < .001 to the Floslek sunscreen advert F(1, 74) = 115.50, p < .001 (see Table 2). In short, visual metaphor adverts on the whole were rated as being more creative than equivalent non-metaphorical adverts. As for comprehensibility, only the Cello ballpoint pen visual metaphor (M = 1.55) and the VW van nonvisual metaphor (M = 1.66) showed low comprehensibility, as indicated by their low scores (M < 2.0). In fact, visual metaphor adverts as an aggregate scored higher for comprehensibility than the counterpart nonvisual metaphors (M = 2.94, M = 2.77). Moreover, six visual metaphor adverts were rated as being statistically more comprehensible than their non-metaphorical visual paired adverts (conversely 3 nonmetaphorical visual adverts were rated as being more comprehensible than their metaphorical counterparts), which suggest that metaphors do not necessarily make the advert more difficult to understand and may in some cases facilitate comprehension. Similar to Experiment 1, we found a majority of visual metaphor adverts to score significantly higher for engagement (11 of 15) ranging in strength from the MSJ Financial Services F(1, 74) = 6.64, p < .05 to the Floslek sunscreen advert F(1, 74) = 26.76, p < .001 (see Table 2). In addition, Experiment 2 also showed a larger number of the adverts as being more effective and having a metaphorical framing effect than the paired non-metaphorical visual adverts (6 and 9 of 15, respectively). Furthermore, there was no difference between the foreign (M = 2.78, SD = 0.69) and nonforeign (M = 3.01, SD = 0.32) advertisement scores for comprehensibility, t(28) = -0.97, p =.34.

Table 2

Means, Standard Deviations, and One-Way Analyses of Variance in Metaphor and Nonmetaphor Visual Advertisements for Experiment 2

Variable	Metaphor		Non-1	metaphor	ANOVA	
	М	SD	М	SD	F(1, 74)	η^2
Cello Ballpoint F	Pen					
EFF	2.63	0.83	2.18	0.88	0.14	.00
ENG	2.60	0.89	2.00	0.85	9.10**	.11
MF	1.97	0.79	2.03	0.76	0.09	.00
COMP	1.55	0.65	2.16	0.99	10.84^{**}	.12
CR	3.00	0.90	1.92	0.95	25.49***	.26
Tabasco Hot Sau	ce					
EFF	2.74	1.06	2.62	0.83	0.28	.00
ENG	3.05	1.18	2.41	0.96	6.76^{*}	.09
MF	2.97	1.10	2.43	1.04	4.78^{*}	.06
COMP	2.63	1.17	2.59	0.83	0.25	.00
CR	3.47	0.80	1.89	0.57	97.72***	.57
Heinz Ketchup						
EFF	3.35	0.90	2.78	0.71	7.99**	.10
ENG	3.42	0.83	2.59	0.72	21.16***	.23
MF	3.53	0.92	2.38	0.98	27.25***	.27
COMP	3.71	0.61	2.60	0.76	49.06***	.40
CR	3.42	0.72	1.84	0.60	106.23***	.59
Frv Light Cookir	1g Oil		1101	0.00	100.20	,
EFF	2.68	0.74	3.05	0.78	4.45*	.06
ENG	3.03	0.87	2.97	0.87	0.06	.00
MF	3.23	0.79	2.76	1.06	4.95*	.06
COMP	2.61	1.13	2.92	1.14	1.44	.02
CR	3 42	0.72	2.32	0.93	29 78***	29
Oxipoder Shirt C	leaner	0.72	2.30	0.95	29.10	
EFF	3.68	0.53	3.59	0.60	0.48	.01
ENG	3.39	0.79	2.86	0.92	7.20**	.09
MF	3 74	0.64	3.65	0.74	0.97	01
COMP	3.84	0.37	3.92	0.28	1.03	01
CR	3 29	0.90	2 57	0.83	12 99***	15
Tovo Car Tires	5.27	0.90	2.37	0.02	12.99	.10
EFF	3 16	0.83	3.03	0.88	0.47	01
ENG	3 51	0.87	3.13	0.80	3.87	05
MF	3 16	0.93	2 37	1.02	12 34***	15
COMP	3.22	0.92	2.53	1.00	9.62**	.12
CR	3.86	0.42	2.55	0.88	61 33***	46
New Balance Ru	nning S	Shoes	2.01	0.00	01.55	.10
EFF	3 00	0 74	2 92	0.85	0.18	00
ENG	3 27	0.90	2.52	0.99	7.18 ^{**}	.00
MF	3.57	1 12	1.58	1.06	20 79***	.02
COMP	2.67	0.98	2 47	0.98	0.43	.22
CR	3 49	0.50	2.17	0.90	46 35***	39
Australian Postal	Servic	e 0.02	2.21	0.91	10.55	
EFF	3 35	0 72	2 32	0.87	31 46***	30
ENG	3 46	0.72	2.52	1 1 2	20 10***	.50 22
MF	3.40	1.05	2.45	1.12	2 43	.22
COMP	2.05	1.05	2.00	0.98	5 92*	.05
CR	3.76	0.43	2.34	0.81	87.32***	.55

Variable	Metaphor		Non-metaphor		ANOVA	
-	М	SD	M	SD	F (1, 74)	η^2
Floslek Sunsc	ereen				, <i>,</i> , ,	
EFF	3.73	0.61	3.21	0.70	11.67**	.14
ENG	3.78	0.58	2.84	0.95	26.76***	.27
MF	3.59	0.69	3.00	0.93	9.89**	.12
COMP	3.84	0.55	3.42	0.76	7.36**	.09
CR	3.78	0.42	2.16	0.82	115.50***	.61
VW Van						
EFF	2.30	0.91	2.24	0.75	0.10	.00
ENG	2.68	1.11	1.97	0.91	8.98^{**}	.11
MF1	1.95	0.91	1.82	0.80	0.433	.00
MF2	3.38	0.79	2.68	0.84	13.48***	.16
COMP	2.24	1.04	1.66	0.71	8.17^{**}	.10
CR	3.11	0.88	1.84	0.59	54.00***	.43
MSJ Financia	l Services					
EFF	3.16	0.82	2.65	0.89	6.64^{*}	.08
ENG	2.89	0.92	2.05	0.88	16.26***	.18
MF	3.55	0.65	1.86	0.79	103.35***	.59
COMP	3.11	1.11	2.68	1.03	3.02	.04
CR	3.16	0.92	1.78	0.82	46.71***	.39
Kagome Tom	ato Juice					
EFF	2.89	1.06	3.27	0.73	3.17	.04
ENG	2.97	1.08	2.70	0.74	1.60	.02
MF	2.71	1.14	3.70	0.52	23.41***	.24
COMP	3.03	1.03	3.62	0.64	9.04**	.11
CR	3.26	0.92	2.30	0.70	26.00***	.26
Toshiba Semi	conductors	•••				
EFF	3.16	0.79	2.68	0.58	9.05**	.11
ENG	2.97	0.94	2.41	0.83	20.29***	.22
MF	2.95	0.98	2.41	0.83	6.61*	.08
COMP	3.18	0.93	2.49	0.87	11.30**	.13
CR	3.24	0.88	2.95	1.20	1.43	.02
Kikkoman Sa	uce	0.00	, c		11.10	
EFF	3.59	0.60	3.13	0.70	9.39**	.11
ENG	3.84	0.37	3.26	0.79	15.92***	.18
MF	3.03	0.90	2.92	0.94	0.25	.00
COMP	2.97	0.87	3.08	0.94	0.26	.00
CR	3.81	0.40	2 42	0.92	71 56***	50
Nishin Cup N	loodles	0.10	2.12	0.92	/1.00	
EFF	2 95	1.03	3 21	0.84	1 49	02
ENG	3.46	0.80	3.30	0.81	0.75	.01
MF	2.51	1.10	3.23	0.88	9.93**	.12
COMP	2.31	1 13	3 21	0.84	4 90*	06
CR	3.54	0.61	2.61	0.91	27.04***	.27

Note. N = 75. EFF = effectiveness; ENG = engagement; MF = metaphorical framing; COMP = comprehensibility; CR = creativity.

*p < .05. **p < .01. *** p < .001.

Discussion

This study provides evidence that visual metaphors in advertisements are more engaging and viewed as being more creative than equivalent visual non-metaphor adverts. One is engaged by things one finds pleasing and therefore invests more time interacting with the given stimuli. In the case of these two experiments in this study, despite the added cognitive effort in linking the two semantic fields (coffee - alarm clock or sunscreen - parasol), visual metaphors were scored as being more engaging and this often overlapped with them also being viewed as more creative. Based on data from Experiment 1, adverts that did not show significance for engagement, we interpreted this as resulting from a breakdown in comprehension due to the complexity of the visual metaphor. Therefore, we conducted a second experiment that also looked at comprehensibility, as noted by Phillips (2000), providing the viewer with a visual metaphor that demands too much cognitive processing has risk for it might confuse the viewer. However, we did not find any evidence for this, at least based on our measurement items. For example, despite the Cello ballpoint pen visual metaphor scoring lowest for comprehensibility among all the adverts, it still was viewed as being significantly more engaging than the nonmetaphor equivalent in both experiments. One visual metaphor advert that did not show significance across both experiments for engagement was the cooking oil advert. In this advert, the metaphor focused on the lightness of the oil, so the vegetables appeared floating as a bunch of balloons. A salient feature of balloons is their lightness, and this gets projected onto the vegetable oil and when applied to vegetables, they taste light and refreshing (not heavy). Yet, failing to focus on this semantic feature of balloons could result in confusion since one also has to suppress other semantic features of them like being round shaped, made of rubber, used for celebrations, filled with helium, and so on.

In regard to the metaphor framing effect, this effect was not as prominent as engagement, but still prevalent in many adverts. The three adverts that showed the strongest effect were the Heinz ketchup advert (tomato - freshness), Toy car tires advert (octopus tentacles effectiveness in driving in the rain), and Floslek sunscreen advert (parasol – effectiveness for sun protection). These findings were also replicated in Experiment 2. The strong effect size for the ketchup advert indicates that the metaphor (viewing the bottle of ketchup as a fresh tomato) had a powerful influence on how the viewers perceived the product. This could be due to the fact that ketchup is processed and kept in a bottle and thus not typically viewed as being fresh. Yet, the visual metaphor breaks this assumption and forces the viewer to focus on the freshness of the main ingredient. The car tires advert is another interesting example. The metaphor framing effect, effectiveness in driving in the rain, showed a strong effect in both experiments. The gripping power of the octopus tentacles gets projected onto the car tires, which in turn, are viewed as being effective for driving on wet roads. Finally, the sunscreen visual metaphor advert, where the sunscreen tube is a parasol for the beachgoers and covers them in a shade, also showed a very strong metaphor framing effect as being more effective for sun protection than the non-metaphor advert for the same product. One possible explanation is that the shade from the parasol is visibly protecting the beachgoers against the sun light compared to the literal application of sunscreen, which is transparent on the skin and thus not visibly seen as protecting one against the sun. Inconsistent with most of our findings, in Experiment 2, two of the non-foreign Japanese adverts (cup noodles and tomato juice) showed a reverse metaphor framing effect, where the non-metaphor visual advert showed the effect. For example, for the tomato juice advert, the tomato was in the place of a heart on the x-ray screen while the nonmetaphor presented the product with fresh vegetables behind it and the metaphor framing effect question was, "Do you think this juice is good for your health?". One possibility here is that the x-ray image evoked a hospital frame for the viewer, which might have lowered their perception of health while viewing the advert.

As for effectiveness, the visual metaphor adverts were only viewed as being more effective in less than half of the total adverts (4 of 14, Experiment 1 and 7 of 15, Experiment 2). This indicates that despite a majority of the adverts as being rated as more engaging and creative, this does not necessarily result in them being evaluated as a more effective advert. Therefore, further studies need to look more closely at the attributes that a viewer considers when judging the effectiveness of an advert. Data collected in this study shows that it is complex construct that likely includes other factors like context, color, imagery, and individual differences.

Finally, in Experiment 2, we showed that non-foreign adverts were not rated as being any easier to comprehend than foreign adverts. Further research still needs to examine the effect culture has on visually encoded messages like visual metaphors (Van Mulken et al., 2010), particularly how they exploit a source concept that may vary in meaning across cultures.

On a practical perspective, from the data gathered in this study, the following are suggestions to consider for advertisers when designing a visual metaphor. Select a source that has a clear and salient property that can be mapped onto the topic (e.g., sunscreen – parasol shade; property "cover from the sun"). Also, for highly complex or difficult to understand visual metaphors (e.g., pen and hammock), extra explanatory information may enhance comprehension and appreciation (see Mills, 2001; Phillips, 2000; Van Rompay & Veltkamp, 2014) and thus improve the *visual metaphor effect*. Finally, visual elements like an x-ray likely activates a broad frame (e.g., hospital), which might result in the viewer associating the product with unintended negative attributes of this frame (e.g., sickness, unhealthiness, disease, etc.).

Conclusion

In conclusion, we paired visual advertisements into two groups, a metaphor and non-metaphor group, and participants ranked them on a number of dimensions. For Experiment 1 this included; engagement, effectiveness, and metaphorical framing effect. For Experiment 2, we added two additional ones; comprehensibility and creativity. Overall, a large number of visual metaphors showed a significant effect for engagement, creativity, and a metaphorical framing effect, but effectiveness only appeared in a small number of these paired advertisements. Moreover, visual metaphor adverts are not more difficult to comprehend than paired non-visual ones. In sum, this study supports the theoretical positions that argue that the creative combination found in visual metaphors has an engaging effect on the viewer, despite the fact that it requires greater cognitive effort. However, this does not always lead to the adverts being rated as more effective.

Conflicts of Interest

The authors declare no conflict of interest associated with this manuscript.

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Relationship between Emotional Intelligence, Maternal Accuracy in the Perception of Infant Emotions, and Parenting Difficulties

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Abstract

This study examined age-related differences in the relationship between parenting difficulties, a mother's emotional intelligence, and the accuracy of a mother's perception of her infant's emotions. Specifically, this study compares three aged-based conditions: (1) infants at the age of three months, when their emotions are undifferentiated, (2) infants at six months, when emotional differentiation is underway, the target is in mutual interaction and triadic interaction begins, and (3) infants at nine months, when their subjective world begins to develop an understanding of the intention of others. A semi-structured interview using controlled VTR stimulation and a questionnaire survey were administered to 74 first-time mothers of infants. In the interview, each mother was asked about the infant's feelings in the VTR and what might explain the infant's emotions. The results of a correlation analysis showed consistent negative moderate correlation between the mother's parenting difficulties and her emotional intelligence, regardless of the infants' age. On the other hand, the partial correlation between the accuracy of a mother's reading of infant emotions and parenting difficulties, controlled for emotional intelligence, showed differences by infant age. Although there was almost no correlation for mothers with a six-month-old infant, mothers with a three-month-old infant showed a positive correlation and mothers with a nine-month-old infant showed a negative correlation. The participants' accounts of the VTR also indicated the mechanism of those age differences. The findings of this research reveal a part of the developmental process of a mother and provide knowledge concerning childcare support.

Keywords: emotional intelligence, maternal accuracy, parenting difficulties

Parenting difficulties experienced by caregivers of infants bring negative outcomes to both parent and child. Parenting difficulties are defined as negative feelings concerning the caregiver's self-awareness of his/her inadequacy as a caregiver (Ida, 2013) and is thought to be the source of parenting stress (Obara, 2005a). High parenting difficulties have been shown to produce negative feelings towards the infant (Shin, Yamada, & Morioka, 2015), reduce the quality of parent-infant interactions, and interfere with the infant's healthy mental development (Nishihara, Hattori, Kobayashi, & Hayakawa, 2006). Okamoto and Yamada (2016) pointed out the relationship between high parenting difficulties and child abuse. In addition, Obara (2005b) showed a link between a mother's difficulty in parenting and depression in studies involving mothers with infants, while Murray, Cooper, and Fearon (2014) found an association with postpartum depression. The need for an intervention to decrease parenting difficulties has also been reported (e.g., Milgrom, Schembri, Ericksen, Ross, & Gemmill, 2011). It seems clear that the mechanism and factors associated with parenting difficulties that have a negative effect on both parents and children need to be clarified.

One of the important factors that determine parenting difficulties is the emotional intelligence of the caregiver. Emotional intelligence is a personality characteristic defined as the set of abilities involving the perception, expression, understanding, use and management of emotions in both the self and others (Salovey & Mayer, 1990). Emotional intelligence, which is essentially the ability to respond to problems in various situations (Mayer, Salovey, & Caruso, 2004), is related to parenting difficulties since it is related to the ability to cope with the general problems of parent-child communication, bonding, and attachment (Gunning, Waugh, Robertson, & Holmes, 2011). Studies of mothers with infants have also shown it to be associated with parenting stress (Ohashi, Katsura, Koshino, & Usui, 2015). Moreover, it has been reported that interventions that enhance a mother's emotional intelligence improve the mother's physical and mental health (Shortt, Stoolmiller, Smith-Shine, Mark Eddy, & Sheeber, 2010). The level of emotional intelligence involved in dealing with not only the quality of communication but also the overall care of the child is thought to have a negative correlation with parenting difficulties regardless of the infant's age or other characteristics.

Nevertheless, because the mother-child relationship is formed by the interaction between caregiver and child (Sameroff, 1993), parenting difficulties that occur in the parent-child relationship are not solely created by caregiver characteristics such as emotional intelligence. In the concept of maternal sensitivity (Ainsworth, 1969), the mother is said to be able to interpret and properly respond to emotional signals from the infant by approaching the infant's internal state. Gallese, Eagle, and Migone (2007) point out the importance of an attuned response that approaches the infant's internal state and the emotional feedback that it produces. It has also been shown that the ability to sensitively interact with the infant is related to low parenting stress (Feldman, Eidelman, & Rotenberg, 2004). Emde and Sorce (1983) indicate that the capacity to read and respond to the infant's emotions in mother-infant interactions is related to the mother's emotional stability. Having mother-infant interactions in which the caregiver reads and responds to the infant's emotions and in which the infant responds accordingly may well affect the level of parenting difficulties experienced by the caregiver.

Whether the caregiver can accurately read the infant's emotions in these mother-infant interactions is an important factor in determining the caregiver's parenting difficulty. In Emde (1983), the mother's appropriate interpretation of the infant's emotional clues is needed to interact with the infant with sensitivity and emotional availability. If the infant's signals cannot be properly interpreted, the quality of the mother-infant interaction suffers (Donovan, Leavitt,

& Walsh, 1998). Meins, Fernyhough, Fradley, and Tuckey (2001) showed a positive correlation between how often a mother properly reads and speaks to the infant's mental state and the positivity of the mother-infant relationship. In Broth, Goodman, Hall, and Raynor (2004), a precise reading of the infant's emotions has been shown to be associated with high quality mother-infant interactions. Thus, the caregiver's ability to read the infant's emotions accurately is an important factor that determines the quality of the interaction, which is thought to be associated with the magnitude of the mother's parenting difficulties.

Although both emotional intelligence and the ability to accurately perceive the infant's emotions are important factors that affect the caregiver's parenting difficulties, the timing of their effect appears to be different. Emotional intelligence consists of the ability to monitor the emotions of one's self and others and to adjust to them (Salovey & Mayer, 1990). The ability to monitor the emotions of others and the accuracy of one's reading of those emotions are similar, but the ability to monitor and adjust does not necessarily mean the ability to read emotional intelligence, is characterized by a high expectation of positive results and is different from precise expectation (Otake, Shimai, Uchiyama, & Utsuki, 2001). Mothers with high emotional intelligence, including such traits as optimism and control, have been shown to have lower parenting stress (Ohashi et al., 2015). While having high emotional intelligence is almost certain to reduce parenting difficulties, the precise reading of emotions may not always serve as such a reducer.

The relationship between accuracy in reading infant emotions and parenting difficulties may indeed differ according to the infant's age. Communication between infant and mother is an asymmetric relationship (Adamson, Bakeman, Smith, & Walters, 1987) that is established by interpreting the infant's immature behavior as having meaning (e.g. Kaye, 1979; Marcos, Ryckebusch, & Rabain-Jamin, 2003). When the child is in early infancy, the infant's emotions are not clearly differentiated (e.g., Campos, 2004; Sroufe, 1996); they tend to be ambiguous and vague and not connected to identifiable events (Camras, Sullivan, & Michel, 1993). Because an infant's emotions are particularly undifferentiated before the age of three months (Lewis, 2000), attempting to accurately read the infant's emotions at this time may produce an over-sensitivity in the mother and thus increase her parenting difficulties. On the other hand, a subjective world involving emotions, motivation, and intent appears when an infant is roughly nine months old (Stern, 1985). At this age, infants begin to understand the other person as a purposeful party, and their response changes to one that understands the intention of the other person (Tomasello, 1995). A mother's precise reading of the intentional emotional expression of the infant leads to the infant's emotional response, which can lead to a smooth mother-infant interaction. Thus, when the infant's age is approximately nine months, a precise reading of emotions may reduce parenting difficulties.

The Purpose and Hypotheses of this Study

The purpose of this study is to consider age-related differences in the relationship between parenting difficulties, a mother's emotional intelligence, and the accuracy of a mother's perception of her infant's emotions, which is the origin of mother-infant interaction. Specifically, this study compares three aged-based conditions: (1) infants at the age of three months, when their emotions are undifferentiated (Lewis, 2000), (2) infants at six months, when emotional differentiation is underway, the target is in mutual interaction and triadic interaction begins (Newson & Newson, 1975), and (3) infants at nine months, when their

subjective world begins to develop an understanding of the intention of others (Stern, 1985; Tomasello, 1995).

Because emotional intelligence is the ability to cope with various problems, it is expected to correlate negatively with parenting difficulties, regardless of the infant's age (Hypothesis 1). On the other hand, because reading an infant's emotions accurately is related to the infant's age, the relationship between the accuracy of the mother's perception of the infant's emotions and parenting difficulties is expected to differ according to the infant's age. It is expected that there will be a positive correlation when the infant is three months old, a weak negative correlation when the infant is six months old, and a negative correlation when the infant is nine months old (Hypothesis 2). When testing Hypothesis 2, this study considers the mechanism of age by identifying the context and the kinds of emotions that are being read by the mother at the various infant ages.

There are two primary ways to assess a mother's reading of an infant's emotional state: (1) observing actual interactions between a mother and infant, and (2) measuring a mother's response to regulated stimuli such as a photo and a video image. Because a mother's response is highly likely to be affected by her infant's particular characteristics, the latter approach is thought to be more appropriate to capture common developmental differences. Thus, in this study, validated and controlled video stimulation (Shima, Obara, Kobayashi, & Ueshima, 2009) rooted in a daily context measuring an infant's emotions was used for examining the hypotheses and underlying mechanisms.

Methodology

Participants

After listening to an explanation of the purpose and contents of the study at an open pediatric clinic and community health center, 74 first-time mothers who were raising a child under one year of age were approved for participation in the study. The mothers' average age was 30.91. The group was composed of 50 full-time housewives, 18 mothers who worked outside the home, and six participants who did not indicate their status. The investigation was conducted within two weeks of the child's turning three, six, or nine months of age, at the time of a health examination, vaccination or similar event. In all, the study included 20 mothers with a three-month-old infant, 22 mothers with a six-month-old infant, and 32 mothers with a nine-month-old infant.

Procedure

A semi-structured interview and a questionnaire survey were conducted. The questionnaire was sent by direct mail one week before the interview; participants were asked to complete the questionnaire by the day of the interview. The interview survey was conducted using video stimulation (Shima et al., 2009) in a private room at home or at a nearby pediatric clinic, according to the preference of each participant.

Questionnaires

Parenting difficulties

To measure parenting difficulty, the parenting difficulties subscale of the JCFRI (Japan Child and Family Research Institute) Child Rearing Support Questionnaire (Kawai, Shoji, Chiga, Kato, Nakamura, Taniguchi, Tsunetsugu, & Ando, 2000) was used. Kawai, Tsunetsugu, and Shoji (2000) showed the validity and reliability of this scale. The subscale consists of eight items such as "I don't have confidence in raising children," "I don't know how to discipline them," and "I feel difficulty raising children." This subscale uses a four-point scale ranging from 1 to 4. In order to consider the reliability of the scale, Cronbach's α coefficient was calculated; the value was adequate ($\alpha = .84$).

Emotional Intelligence

To measure emotional intelligence, the Emotional Intelligence Scale (Otake et al., 2001) was used. Otake et al. (2001) and Shimai, Otake, Utsuki, and Uchiyama (2002) showed the validity and reliability of this scale. The scale consists of 65 items, such as "I know how I feel when I become emotional," "I want to make other people happy," and "I can respond well to changes in circumstances." This scale uses a five-point scale ranging from 0 to 5. As an indicator of the reliability of the scale, Cronbach's α coefficient was calculated; the value was adequate ($\alpha = .97$).

Semi-Structured Interview

VTR Stimulation

Part of the video stimulation established and validated by Shima et al. (2009) was used in the interview portion of the study. The stimulus consisted of twenty video clips showing three-, six-, nine-, and twelve-month-old infants. Each clip was 15 seconds long. There were five video clips for each of the infant ages: one video clip showing a positive emotional state, one showing a negative state, and three showing a neutral state. The positive video clips showed a baby babbling or playing with a toy, and so on. The negative video clips showed a baby lying on its back, crying on the floor, and so on. The neutral video clips showed a baby lying on its back with no facial movement, staring at the camera on the floor, and so on. Video clips showing infants whose ages were the same as the age of the participant's infant were used. For example, video clips showing a three-months-old baby were shown to a mother with a three-month-old infant. Following the procedure of Shima et al. (2009), the video clips were presented in the order of positive, neutral, negative, neutral and neutral.

Semi-Structured Interview

After a second explanation of the research content and an assurance of privacy, a consent to record the interview contents with an IC recorder was obtained from each participant. In the interview, following Obara and Ueshima (2013), one of each type of video clip was presented; the mother was then asked about the infant's feelings in the clip ("What kind of emotional state is the baby in?") and what might explain the infant's emotions ("Why do you think the baby is in such an emotional state?"). The total interview time for each participant was approximately 30 minutes.
Results

Coding of Interview Records

Questions about the Infant's Emotions

For each video clip, the mother's description of the infant's emotional state was classified as a reading of negative emotions, positive emotions, neutral emotions, physiologic needs, and other by using the framework of Obara and Ueshima (2013). The number of matches between the classified emotional categories and the emotion in the video stimuli was used as an indicator of the accuracy of the mother's perception of the infant's emotional state. That is, the accuracy score was calculated as the sum of the number of times a positive emotion was correctly read from a negative emotion video clip, the number of times a negative emotion was read from a neutral video clip. The range of this score was from 0 to 5. The average and standard deviation of the accuracy scores for each infant age group are shown in Table 1. The number of emotions of each type read from each video and its ratio in each age group are given in Table 2.

Table 1

Descriptive Statistics of Parenting Difficulties, Emotional Intelligence, and Accuracy of Reading Emotions

	3 mc	3 months		6 months		9 months		All months	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Parenting difficulties	2.19	0.76	2.06	0.51	2.10	0.58	2.11	0.61	
Emotional intelligence	1.79	0.43	2.00	0.61	2.06	0.60	1.98	0.57	
Accuracy of reading emotions	1.65	0.88	2.23	0.92	1.59	0.87	1.80	0.92	

Table 2

The Number of Each Emotion Read from Each Video Clip and Its Ratio at Each Age

	Nega	Negative video clips			Neutral video clips			Positive video clips		
	3 months	6 months	9 months	3 months	6 months	9 months	3 months	6 months	9 months	
N	5	12	17	3	2	10	0	1	0	
Negative emotion	25.00	54.55	53.13	5.00	3.03	10.42	0.00	4.55	0.00	
Neutral emotion	10	9	12	13	16	15	1	0	5	
	50.00	40.91	37.50	21.67	24.24	15.63	5.00	0.00	15.63	
D	0	1	1	38	38	62	19	21	27	
Positive emotion	0.00	4.55	3.13	63.33	57.58	64.58	95.00	95.45	84.38	
	5	0	2	4	6	8	0	0	0	
Physiological need	25.00	0.00	6.25	6.67	9.09	8.33	0.00	0.00	0.00	
Others	0	0	0	2	4	1	0	0	0	
	0.00	0.00	0.00	3.33	6.06	1.04	0.00	0.00	0.00	

Note. Upper row indicates frequency, lower row indicates ratio (%).

Questions about How to Read the Infant's Emotions

Responses to the second question were classified according to the context category that the caregiver used to read the infant's emotions (Obara & Ueshima, 2013). That is, the responses were classified as indicating an objective context, which consisted of "the infant's behavior, utterance, and expression," "the caregiver's behavior," "the mother-infant interaction," or "the environment," or, alternatively, as indicating a subjective context, which consisted of "the infant's infant's internal state," "the experience of parenting," or "a parenting belief." The average number of occurrences of each context category used in reading the infant's emotional state is shown in Table 3.

Descriptive Statistics for Parenting Difficulties and Emotional Intelligence

Table 1 shows descriptive statistics for the parenting difficulty, emotional intelligence and accuracy in reading emotions results for the various infant age groups. Correlation coefficients indicating the association between these various measures were also calculated (Table 4).

Table 3

Average Occurrence of the Contexts Used for Reading Emotions at Each Age

	3 m	oths	6 mc	onths	9 mc	onths
	Mean	SD	Mean	SD	Mean	SD
Objective context						
Infant's behavior, utterance, and expression	4.50	0.76	4.45	0.67	4.75	0.44
Caregiver's behavior	0.15	0.49	0.00	0.00	0.00	0.00
Mother-infant interaction	0.30	0.57	0.00	0.00	0.03	0.18
Environment	0.45	0.76	2.00	1.27	1.88	1.29
Caregiver's subjective context						
Infant's internal state	2.75	1.02	3.41	1.14	3.13	1.39
Experience of parenting	0.35	0.59	0.18	0.39	0.22	0.42
Parenting belief	0.35	0.67	0.18	0.39	0.28	0.52

Table 4

Correlations for Parenting Difficulties, Emotional Intelligence, and Accuracy of Reading Emotions

	Parenting difficulties			Emotional intelligence		
(month)	3	6	9	3	6	9
Emotional intelligence	53 *	57 **	53 **			
Accuracy of reading emotions	.45 *	06	17	29	.21	35

Relationship Between Parenting Difficulties, Emotional Intelligence, and the Accuracy of Reading Emotions

The correlation coefficient for the relationship between emotional intelligence and parenting difficulties was -.53 in the three-month group, -.57 in the six-month group, and -.53 in the nine-month group. To examine differences in these correlation coefficients, a χ^2 equivalence test was conducted. The results showed no significant differences (χ^2 (2) = 0.04, *n.s.*).

Because emotional intelligence may be related to both accuracy in reading emotions and parenting difficulties, it is necessary to exclude the impact of emotional intelligence when testing the relationship between the other two variables. Therefore, partial correlation coefficients were calculated for the possible relationship between accuracy in reading emotions and parenting difficulty for each infant age group, with emotional intelligence included as a covariate. According to results, in the three-month group, there was a weakly positive correlation (pr = .36), while the six-month group showed almost no correlation (pr = .08), and the nine-month group showed a moderately negative correlation (pr = .45). To assess the possible age-related differences in these coefficients, a χ^2 equivalence test was again conducted; test results indicated a significant difference (χ^2 (2) = 8.77, p < .05). Therefore, a correlation test in which the significance level was adjusted using the Bonferroni method was performed. Results showed a significant difference between the three-month group and the nine-month group (z = 2.82, p < .05). On the other hand, there was no significant difference between the six-month and three-month groups (z = -0.89, n.s.) or between the six-month and nine-month groups (z = 1.91, n.s.).

Age Differences Related to the Emotions Read and the Contexts Used for Reading Infant Emotions in Each Video Clip

Age Differences Related to the Emotions Read in Each Video Clip

To test the age difference of emotions read in each video clip, Fisher's exact test was conducted for each type of emotional video clip shown in the cross-tabulations in Table 2. Results showed that only the cross-tabulations of the negative emotion video clips were significant (p = .06). Therefore, a residual analysis was done on cells with a magnitude of more than five thought to follow the model distribution. Results indicated that the number of negative emotions read by mothers with a three-month-old infant was significantly less than the expectation (p < .05) and that the number physiologic needs indicated by mothers with a three-month-old infant was significantly more than the expectation (p < .01).

Age Differences Related to the Contexts Used for Reading Emotions

To test age differences for the contexts used in reading the infant emotions in each video clip, an ANOVA was performed in which the dependent variable was context category and the independent variable was infant age. The results of the ANOVA showed significant differences in "mother-infant interaction" (F(2, 71) = 5.79, $_p\eta^2 = .14$, p < .01) and "the environment" (F(2, 71) = 11.78, $_p\eta^2 = .25$, p < .01). A multiple comparison using the Tukey method showed a significant difference in "mother-infant interaction" between mothers with a three-month-old infant and mothers with a six-month-old infant (p < .01) and mothers with a nine-month-old infant (p < .05). The score for mothers with a three-month-old infant was higher than that of mothers with six- and nine-month-old infants. Additionally, results showed that for "the environment" there were significant differences between mothers with a three-month-old infant

and mothers with a six-month-old infant (p < .01) and mothers with a nine-month-old infant (p < .01). The score for mothers with three-month-old infants was lower than that of the mothers of six- or nine-month-old infants.

Conclusion

The purpose of this study was to investigate age-related differences in the relationship between parenting difficulties, emotional intelligence, and the accuracy of a caregiver's perception of an infant's emotions. A semi-structured interview using controlled VTR stimulation and a questionnaire survey were administered to 74 first-time mothers of infants. The study tested two hypotheses and investigated differences based on infant age.

The Relationship Between Parenting Difficulties, Emotional Intelligence, and Accuracy in the Perception of an Infant's Emotions

The results of a correlation analysis showed consistent negative moderate correlation between parenting difficulties and emotional intelligence among mothers with three-, six-, and nine-month-old infants, and indicated no age difference in the relationship. This result supports Hypothesis 1 that emotional intelligence is negatively related to parenting difficulties regardless of the infant's age. This is not surprising since emotional intelligence is the ability to cope with extensive problems (Mayer et al., 2004). This is also consistent with the relationship between emotional intelligence and parenting stress shown in a previous study of mothers with infants 0 to 4 years of age (Ohashi et al., 2015). The current study showed a negative relationship between parenting difficulties, the core of parenting stress, and emotional intelligence that was independent of infant age for mothers with infants under the age of one year. From a parenting difficulties viewpoint, the study suggests the importance of emotional intelligence, not only in success at school and the workplace (Goleman, 1995), but also in child rearing.

On the other hand, the partial correlation between the accuracy of a mother's reading of infant emotions and parenting difficulties, controlled for emotional intelligence, showed differences by infant age. Although for mothers with a six-month-old infant there was almost no correlation, mothers with a three-month-old infant showed a positive correlation and mothers with a nine-month-old infant showed a negative correlation, which supports a large part of Hypothesis 2. It is likely that the positive correlation among mothers with a three-month-old infant is based on the fact that at three months, an infant's emotions are especially undifferentiated (Lewis, 2000) and maternal hypersensitivity is needed to read their emotions precisely. However, by nine months, the infant has become more responsive (Tomasello, 1995). For example, joint attention is developed at about nine months. Thus, because ninemonth-old infants and their mothers are able to interact responsively based on the mother's precise reading of the infant's emotion, a negative relationship between the accuracy of a mother's reading of the infant's emotion and parenting difficulties for mothers of nine-monthold infants seems highly reasonable.

For mothers with six-month-old infants, the partial correlation coefficient indicated virtually no relationship between the accuracy of the mother's reading of the infant's emotions and parenting difficulties, although a weak negative correlation could be expected since triadic interaction begins at the age of six months (Newson & Newson, 1975). Results also indicted that six-month-old infants can interact in dyad communication such as that between mother

and infant, although it is not easy for the infant to respond to surrounding people when they are paying attention to a particular object (e.g., Tronick & Cohn, 1989). Adamson (1995) pointed out the importance of a parental approach that uses the direction of the infant's attention. Although maternal oversensitivity is not necessary for precisely reading an infant's emotions in dyad communication, no relation was found between the accuracy of the mother's reading of the infant's emotions and parenting difficulties since it is necessary for smooth mother-infant interaction to adjust to the direction of infant's attention. Results also indicate that an accurate reading of infant emotions becomes important after nine months from the infant's birth, when the infant can, at least to a certain extent, be responsive (Tomasello, 1995).

The Mechanism of Age Difference in the Relationship Between Parenting Difficulties and the Accurate Reading of Infant Emotions

The results of Fisher's exact test showed that mothers with a three-month-old infant read few negative emotions and read many physiologic needs when the infant expressed negative emotions. This may, at least in part, relate to the fact that human circadian rhythm is completed at roughly four months (e.g., Armstrong, Quinn, & Dadds, 1994), which means that the sleep rhythm of three-month-old infants has not yet been fully established. Given the finding of Hiramatsu et al. (2006), which showed a relationship between sleep rhythm and maternal parenting stress, failing to read an infant's negative emotions but rather reading the physical needs that are causing the infant's negative emotions and coping with them may lower the parenting difficulties of a mother whose infant is three months of age. Meins et al. (2001) also showed that referencing the infant's internal state rather than maternal sensitivity predicts the future quality of the mother-child relationship. This may be especially important when the infant's sleep rhythm is not yet completely established. Consequently, this may well be the mechanism behind the negative correlation between the accurate reading of emotions and parenting difficulties for mothers with three-month-old infants.

On the other hand, ANOVA results showed that mothers with three-month-old infants frequently used "mother-infant interaction" as the context for reading the infant's emotions, while few indicated "the environment." As stated above, satisfying physiological needs is important for three-month-old infants since their sleep rhythm is still immature (e.g., Armstrong et al., 1994). It is thought that reading emotions in an environmental context offers a better alternative for identifying and responding to an infant's physiological needs since physiological needs are not evoked from mother-infant interactions. However, the finding in this study is just the opposite. Many mothers may feel that mother-infant interaction is important in the early process of becoming a mother. Indeed, Mercer (2004) showed that mothers proceed to the process of taking on their maternal role through experiences in which they can respond to their infant properly via mother-infant interactions from puerperium. However, this study showed the possibility of higher parenting difficulties associated with reading an infant's emotions using the context of mother-infant interaction when the infant is three months old. This result suggests a trade-off between proceeding to taking on a maternal role and parenting difficulties for mothers of three-month-old infants.

Implications and Limitations

This study examined the relationship between the accurate reading of infant emotions and parenting difficulties, controlling for emotional intelligence. Focus was on the effect of infant age on the relationship. Findings suggest that it may be possible to lower parenting difficulties at various infant ages through an educational intervention that teaches caregivers how to read

their infant's emotions. For example, parenting difficulties among mothers with a three-monthold infant may be lowered by focusing not on the negative emotion of the infant but rather on its physiological needs and using the environmental context. Study findings may also be suggestive of the proper timing of support programs for the mother-infant relationship such as Circle of Security (e.g., Marvin, Cooper, Hoffman, & Powell, 2002), which has substantial empirical research support. Huber, McMahon, and Sweller (2016) pointed out that Circle of Security is effective for reducing parenting stress and psychological symptoms during the time the child is from one to seven years old. The current study essentially extends this finding and shows a relationship between the accurate reading of an infant's emotions and parenting difficulties among mothers with a nine-month-old infant, suggesting that an intervention such as Circle of Security may reduce maternal parenting difficulties at this earlier age. The findings of this research regarding age differences reveal a part of the developmental process of a mother and provide knowledge concerning childcare support.

The current study has some limitations that suggest several future tasks. For example, the development of an infant's dyadic and triadic interaction that is used as the basis for the hypothesis and the interpretation of results involves gender differences (e.g., Tronick & Cohn, 1989) that should be explored. In addition, mothers with six-month-old infants had an accuracy score for reading an infant's emotion that was higher than the score of mothers with three- and nine-month-old infants. This study was unable to provide an explanation for this difference (e.g., the infant's age, sampling error, and so on). Also, all the findings of this study are based on cross-sectional data. Future research needs to identify causal relationships with gender and age differences for each index by using a longitudinal approach and including more participants. It should be noted, as well, that attachment theory focuses not only on maternal sensitivity to the child's signal but also seeing things from the child's point of view (Fonagy & Target, 1997; Koren-Karie, Oppenheim, Dolev, Sher, & Etzion-Carasso, 2002). Although the focus of this research is on accurately reading the child's signal, research focused on such accuracy from the child's point of view is needed.

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Online Health Information Seeking Behavior and Thriving Quotient in the COVID-19 Pandemic: The Mediating Role of Mental Toughness

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Abstract

Accurate and dependable health information has been shown to support students' thriving capacity and overall well-being, especially during a pandemic, when students' well-being is critical. The issue is unclear as to what truly supports the established link between students' ability to thrive in the event of a COVID-19 pandemic. This study looks at the correlation between online health information seeking behavior (OHSIB) and thriving quotient (TO) and the role of a positive construct known as mental toughness (MT). Researchers enrolled 830 males and females from universities in the Philippines. Online Health Seeking Information Behavior (OHSIB-12), the modified and adapted Mental Toughness Questionnaire (MTQ-18), and the Thriving Quotient (TQ-30) were used as accurate and legitimate research instruments. We discovered meager levels of MT and TQ subcomponents and a high level of OHSIB in most university students. Correlation analyses revealed a positive relationship between online health information seeking behavior, mental toughness, and the thriving quotient. Mediation analysis revealed a significant mediation effect, but only on a partial scale. Developing a healthy online information search can assist students in making healthier choices, which in turn helps them feel better, thrive in an uncertain world, and achieve academic success. Mental toughness is also critical for students to access reliable health information online and thus achieve their goals even in the event of a pandemic. Proper guidance from education and health authorities was recommended for students' OHSIB. The implications of the findings for future research were discussed.

Keywords: mental toughness, online health information, pandemic, thriving quotient

Background of the Problem

For a large number of students, the COVID-19 pandemic created an unprecedented level of concern. Fear and anxiety about the new disease and what might happen have impacted them in a variety of ways (Center for Disease Control and Prevention, 2020). With the psychological difficulties and pressures they are currently experiencing, it is reasonable to expect that their academic performance will suffer in varying degrees (Iglesias-Pradas et al., 2021; Mahdy, 2020). Being able to thrive rather than simply survive during a period of vulnerability to one's mental and physical health is a significant task that every student should undertake. The literatures emphasize that when an individual is thriving, he or she has an advantage over numerous obstacles and abrupt changes (Richardson et al., 2012; Siegel & Siegel, 2014). Thriving was even emphasized as a critical component of college students' success (Lloyd, 2019). As the COVID-19 pandemic continues, more people are conducting accelerated online health searches for symptoms of physical or mental illnesses. While physical and mental health concerns are not new in higher education, the pandemic increased students' vulnerability to feelings of sadness, demotivation, and even anxiety as a result of the isolation and university closures, which impacted their academic performance and overall well-being (Centers for Disease Control and Prevention, 2020; Elmer et al., 2020; Zhang et al., 2021). Under these conditions, their capacity to thrive is expected to dwindle.

Because health is one of the most vital aspects of life, it is reasonable for each individual to be concerned about their health and value the ability to take care of themselves through access to health information (Shehata, 2020). Online health information seeking has been shown to aid in informed decision making, increased knowledge, increased trust in medical experts, increased self-care ability, increased quality of life, increased hope and empowerment, and decreased fears and anxiety (Chu et al., 2017a; Finset et al., 2020; Lambert & Loiselle, 2007; Singh & Brown, 2014). However, unreliable online health information proliferates on the internet, particularly during pandemics. Unfortunately, when students lack access to reliable health information, their academic success suffers (Ashkanani et al., 2019; Centers for Disease Control and Prevention, 2019). Thus, it is prudent to verify the website first in order to access reliable information, particularly during a pandemic (Joshi et al., 2020). When a student searches for information on unverified websites, such as some unverified posts on social media, and is presented with unreliable information, the potential for an improvement in his or her overall health and well-being is palpable (Ahmad & Murad, 2020; Maftei & Holman, 2020). Given the implied negative and positive effects from the recently published studies of online health information access on students' academic success or ability to thrive during a pandemic, an imperative trait may be strengthening the association. Recent studies presented the theoretical underpinnings for the relationship between online health information seeking behavior and thriving quotient.

As a result, the current study hypothesizes that mental toughness may be a specific personality trait that would enable students to access reliable health information and thrive in the event of a pandemic. Hypothetically, they can control their thoughts, manage their emotions, and remain functional in times of distress if they exhibit mental toughness traits (Clough et al., 2002), and thus carefully evaluate what is happening to them. Mental toughness has also been shown to have a beneficial effect on students' academic performance, interpersonal relationships, and overall academic success (St Clair-Thompson et al., 2015; Stock et al., 2018). However, research on the application of mental toughness in health and academic settings is scarce. Two general hypotheses are put forward: (a) online health information seeking behavior, mental

toughness and thriving quotient are positively related (b) mental toughness has a mediating role between online health information seeking behavior and thriving quotient.

Methods

Research Design

This study is primarily quantitative in nature, and it makes extensive use of a mediational design, which seeks to explain 'how' or 'why' an effect occurs (Figgou & Pavlopoulos, 2015). Additionally, a descriptive-correlational design was used to determine the relationship between the variables that was sought after.

Population and Sampling Technique

The participants were university students enrolled in higher educational institutions in the Philippines between the ages of 18 and 35 during the academic year 2020-2021. There were 146 males and 667 females who took part in the study (n=830). The participants were selected from public and private universities in the Philippines in order to ensure a representative sample of respondents from across the country. According to the Sage Handbook of Online Research Methods (Fielding et al., 2016; Fricker, 2016), a non-probability sampling was used to incorporate the volunteer (opt in) panel, which can be conducted either online or via e-mail. Volunteer (opt-in) panels are initiated when participants choose to participate as a result of an invitation posted on a Facebook page created by the corresponding author. Respondents to the Facebook ads are redirected to a specific panel portal, which is in the form of a Google form, where they are asked to fill out the necessary information and complete the questionnaires. Responses were gathered through the use of a Google Form.

Research Instruments

In this study, questionnaires and validated research instruments were used. The instruments were validated by ten experts in psychology and research (psychology professors, assessment psychologists, test developers, social science experts). And it was ensured that these experts had at least master's degree. Cronbach's Alpha was used to specifically determine the internal consistency of the three research instruments, allowing us to know the applicability of the items for the study.

The Online Health-Seeking Information Behavior Scale (OHSIB) was used to assess the respondents' online health seeking behavior. OHSIB is a unidimensional self-report survey designed to assess the acceptability of college students' online health information seeking behavior. It is scored on a 5-point scale (ranging from 1 to 5). In terms of OHSIB's psychometric property, Cronbach's alpha revealed a good internal consistency (r = .70). OHISB 12 items (e.g. *the health information I find online helps me to practice positive health habits, I search over the internet for health information because I know it can prevent what could go wrong about my health*) are all based on a systematic review of literatures that demonstrate coping with a bad health situation, involvement in medical decision making, and preventive health behaviors (Chu et al., 2017b; Nangsangna & Da-Costa Vroom, 2019; Shehata, 2020; Singh et al., 2016).

In addition, the Mental Toughness Questionnaire (MTQ-18) was used to assess students' mental toughness. The original MTQ-18 items were used, but they were all modified based on

the characteristics of the participants (Dagnall et al., 2019). In terms of the modified mental toughness questionnaire's psychometric properties, the results revealed that it has good internal consistency for all components such as control (e.g. *I remain calm even when under great pressure*) (r=.71), commitment (e.g. *I remain interested for the tasks I have to do*) (r=.71), challenge (e.g. *I can handle well with any problem that occurs in my life*) (r=.81), and confidence (i.e. *I speak my mind when I have something to say in online class*) (r=.70).

Finally, Schreneir's original Thriving Quotient (TQ) instrument was used to understand student thriving (Schreiner, 2015). All items were used, but they were modified based on the characteristics of the participants. This metric employs a 5-point Likert-type scale. The psychometric properties revealed high internal consistency for engaged learning with five items (e.g. *I feel energized by the ideas I am learning in most of my online classes*) (r=0.82), academic determination (e.g. *I find a way to keep working on my assignments until they are done well*) with six items (r=0.87), positive perspective with five items (e.g. *I am positive about my future*) (r=0.76), diverse citizenship with six items (e.g. *I spend time making a difference in other people's lives*) (r=0.76), and social connectedness (e.g. *I feel content with the kinds of friendships I have despite our distance from each other*).

Ethical Considerations

In accordance with ethical standards, all processes and activities associated with this study have received approval from authors' institution, which has issued an approved certificate. Furthermore, as mandated by Republic Act 10173 or the Data Privacy Act of 2012 of the Republic of the Philippines, the students' personal information is protected.

Data Analysis

The mean, standard deviation, and relationship between online health information seeking behavior, mental toughness, and Thriving Quotient were calculated using descriptive-correlational analyses performed on the constructs using IBM SPSS v26.0. Additionally, a mediation analysis using the partial least squares (PLS) path modeling method was performed in SmartPLS.

Limitations

This study restricted its coverage to first-year to fifth-year College students only enrolled in private and public higher educational institutions that used an online flexible learning approach during the academic year 2020-2021 in randomly selected locations in Luzon, Visayas, and Mindanao. Men's underrepresentation in the current study is also a constraint. Another limitation is a bias that could be explained by the fact that the questionnaires were administered online, and most college students had internet access.

Results

Demographic Analysis

There were a total of 884 responses to the survey. 830 responses were used for statistical analysis after the data was analyzed. 54 responses were discarded because there were more than ten missing items in the answered questionnaires. Table 1 depicts the projected demographic characteristics of the respondents based on their answers. Eighty-two percent

(n=146) of the 830 respondents were male, compared to 18 percent (n=667) of the female respondents. 61 percent (n=495) came from private higher educational institutions, while 39 percent (n=318) came from public higher educational institutions in the Philippines, according to the type of school they attended. All of the students who participated in this study were enrolled in a university that utilized an online, flexible learning strategy.

Table 1

Results by Students' Gender and Academic Year Level

Sociodemo	Sociodemographics				
Gender	Male	146	18%		
	Female	667	82%		
Type of School	Private	495	61%		
	Public	318	39%		

Descriptive Results

As shown in Table 2, majority of the participants' online health information seeking behavior was deemed to be high, implying that their online health searches were conducted solely for preventive health purposes. This indicates that they accessed health information only from reputable and trustworthy websites and relied on medical doctors' advice rather than conducting their own online research. Additionally, typical college students exhibited moderate levels of mental toughness traits such as control, commitment, challenge, and confidence. Finally, descriptive analysis revealed that most students lacked engaged learning, academic determination, and social connectedness, but possessed a more positive outlook and diverse citizenship.

Table 2

Descriptive Results of Students' COVID-19 Related Anxiety, Mental Toughness and Thriving Quotient

Variables		To	tal
	x	sd	Verbal Interpretation
Online Health Information	3.70	0.49	High
Seeking Behavior			
Mental Toughness			
Control	2.52	0.76	Moderate
Commitment	2.80	0.55	Moderate
Challenge	3.29	0.93	Moderate
Confidence	2.58	0.62	Moderate
Thriving Quotient			
Engaged Learning	2.97	0.73	Moderate
Academic Determination	3.42	0.86	Moderate
Positive Perspective	3.80	1.11	High
Social Connectedness	3.15	0.86	Moderate
Diverse Citizenship	3.97	0.97	High

Relationship Between Online Health Information Seeking (OHSIB) and Mental Toughness (MT)

As demonstrated in Table 3, OHSIB is positively correlated with all MT dimensions, including control (r=0.23, p=.00), commitment (r=0.25, p=.00), challenge (r=.28, p=.00), and confidence (r=0.12, p=.00). The findings indicate that the higher the level of OHSIB, the better the participants' MT. As a result of this finding, it can be deduced that browsing the internet for information about their health and then clarifying this information with medical professionals demonstrates mental toughness as well.

Table 3

Correlation analysis Between OHSIB and Mental Toughness Dimensions

Mental Toughness (MT)						
	Control	Commitment	Challenge	Confidence	Mental Toughness	
	r	r	r	r	r	
OHSIB	0.23**	0.25**	0.28**	0.12**	0.30**	
**. Correla	ation is significant at t	he 0.01 level (2-tailed)	*. Correlation is sig	nificant at the 0.05 lev	el (2 tailed)	

Legend: + .29 and below = Low Degree, ± 0.30 and ± 0.49 = Moderate Degree, ± 0.50 and ± 1 = High Degree

Relationship between Online Health Information Seeking (OHSIB) and Thriving Quotient (TQ)

Table 4 demonstrates a positive correlation between OHSIB and dimensions of thriving quotient, with an overall correlation coefficient of 0.38 and a p-value 0.00 at the alpha.05 level of significance. This demonstrates that the frequency with which students engage in OHSIB may have a beneficial effect on their ability to thrive during the COVID-19 pandemic.

Table 4

Correlation Analysis of OHSIB and Thriving Quotient Dimension

	TQ							
	Engaged Learn ing	Academic Determination	Positive Perspective	Diverse Citizenship	Social Connectedness	TQ		
	r	r	r	r	r	r		
OHSIB	0.29**	0.33**	0.30**	0.36**	0.11**	0.38**		
** Connola	tion is significant at t	had 0.01 lowel (2 tailed)	* Complatio	n is significant at	the 0.05 level (2 tailed)			

**. Correlation is significant at the 0.01 level (2-tailed) Legend: + .29 and below = Low Degree, \pm 0.30 and \pm 0.49 = Moderate Degree, \pm 0.50 and \pm 1 = High Degree

Relationship between Mental Toughness (MT) and Thriving Quotient (TQ)

As shown in Table 5, mental toughness had a positive correlation with the thriving quotient in college students, with a correlation coefficient of 0.71 that was statistically significant at the alpha.05 level. This implies that a higher level of mental toughness correlates with an increase in students' thriving quotient in the event of a pandemic.

Thriving Quotient (TQ)							
	Engaged Learning	Academic Determin.	Positive Perspe.	Diverse Citizen.	Social Connect.	TQ	
	r	r	r	r	r	r	
MT						0.71**	
Control	0.38**	0.46**	0.43* *	0.33**	0.29**		
Comm.	0.47**	0.57**	0.49*	0.33*	0.20**		
Chall.	0.47**	0.62**	0.57* *	0.55**	0.26**		
Confid.	0.23**	0.32**	0.33*	0.21**	0.20**		

Table 5

Correlation Analysis of the Dimensions of Mental Toughness and Thriving Quotient

. Correlation is significant at the 0.01 level (2-tailed) ***. Correlation is significant at the 0.05 level (2 tailed) **Legend:** + .29 and below = Low Degree, ± 0.30 and ± 0.49 = Moderate Degree, ± 0.50 and ± 1 = High Degree

Mediation Role of Mental Toughness on the Relationship between Online Health Information Seeking Behavior (OHSIB) and Thriving Quotient (TQ)

A mediation analysis was conducted in order to determine whether mental toughness played a mediating role in the association between online health information seeking behavior (OHSIB) and thriving quotient (TQ). The partial least squares structural equation modeling (PLS-SEM) method was used to test the path coefficients, specific indirect effects, and total effects The findings revealed that the overall effect of OHSIB on TQ was statistically significant (β =0.408, t=13.25,.00000). With the inclusion of the mediating variable mental toughness (MT), it was discovered that the impact of OHSIB on TQ was statistically significant ((β =.191, t=6.69, p=.000). Furthermore, the indirect effect of OHSIB on TQ through MT was found to be statistically significant (β =.217, t=11.50, p=.000). Moreover, the findings indicate that the relationship between OHSIB and TQ was partially mediated by MT, indicating that OHSIB may have a direct impact on students' thriving quotient whether or not MT is present.

Table 6

Mediation Analysis of the Role of Mental Toughness Between OHSIB and TQ

Total Effect			Direct Effect			Indirect Effect			
Path Name	Coeffi	t	р-	Coeffi	t	p-	Coeffici	t	p-
	cient		value	cient		value	ent		value
OHISB -> MT -> TQ	0.408	13.25	.000	0.191	6.69	.000	0.217*	11.50	.000

*. Mediation effect is significant at the 0.05 level

Legend: COV-19=COVID-19 Related Anxiety, OHSIB=Online Health Information Seeking Behavior, IU= Intolerance of Uncertainty, MT=Mental Toughness, , TQ=Thriving Quotient,

Figure 1

Mediation Model on the Mediating Role of Mental Toughness Between Online Health Information Seeking Behavior, and Thriving Quotient



The final model of the current study is depicted in Figure 1. It demonstrates that mental toughness has a partial mediating effect in the relationship between online health information seeking behavior and thriving quotient.

Discussion

The primary aim of the study is to examine the effect of mental toughness on the relationship between online health information seeking behavior and the thriving quotient of college students during a pandemic. The hypothesis that online health information seeking behavior, mental toughness, and thriving quotient were all associated was completely confirmed. Correlation analyses revealed a moderate correlation between the variables. This demonstrates the beneficial and direct effect of very good levels of online health information seeking on students' mental toughness and thriving quotient.

Recent scientific publications point in the same direction. According to previous research, following OHSIB results in an increased sense of control, improved stress and self-management, a commitment to preventive strategies, and confidence regarding their health condition (Beck et al., 2014; Bolle et al., 2015; Kyriacou & Sherratt, 2019; Linn et al., 2019). These findings indicate that OHSIB may have a beneficial effect on students' mental toughness during the COVID-19 pandemic.

The opportunity to seek face-to-face consultation for health concerns is known to be harmed by a number of barriers, including stigma, lockdown policies, and strict quarantine protocols, resulting in inefficient health care (Goyal et al., 2021; Maqbool & Khan, 2020). And online health-seeking may represent an area of support because it allows students to confidently seek assistance for their health problems without being burdened by these same help-seeking obstacles (Gulliver et al., 2010; Pretorius et al., 2019). Students were perceived to seek health information more frequently than others, which is supported by the fact that they used it as an opportunity to obtain resources to improve their lifestyles or avoid potential health concerns (Kalankesh et al., 2019). During the COVID-19 pandemic, university students frequently seek health information online (Dadaczynski et al., 2021). It is believed that their increased awareness of health concerns will result from their use of online health information. Thereby, increasing their level of health literacy (Hassan & Masoud, 2020). Additionally, studies have established a direct and linear relationship between OHSIB and thriving quotient dimensions. For instance, according to Myrick and colleagues' study, OHSIB is positively associated with increased social connectedness and academic self-efficacy or determination (Myrick & Willoughby, 2019), implying that exercising OHSIB may have a beneficial effect on the relationships or interactions between students and their academic success. This corroborates the findings of Vamos and colleagues, who concluded that OHSIB is critical to students' academic success, affecting their level of academic determination and engagement (Vamos et al., 2020). Additionally, Kyriacou and colleagues discovered that OHISB promotes positive life changes or perspectives (Kyriacou & Sherratt, 2019), implying that the more people exercise OHISB, the more positive changes they will experience. The studies linking OHSIB to mental toughness and thriving quotient demonstrate the importance of online health information seeking behavior during the COVID-19 pandemic.

The second hypothesis, which examines the role of mental toughness in mediating the relationship between online health information seeking behavior and the thriving quotient, was partially confirmed. There are currently no studies examining the effect of mental toughness on the constructs under consideration. Thus, it is worth noting that the current study's findings may add to the body of knowledge regarding the specific role of mental toughness in online health information seeking and thriving during a pandemic. The current result indicates that students' online health information searches had a direct positive effect on their thriving quotient, with the exception of mental toughness. Understanding OHSIB as a significant variable in a pandemic context may help to reinforce the notion that it can have a direct effect on students' thriving quotients. Many students are isolated during the pandemic due to university closures and quarantine protocols (Zaccoletti et al., 2020), which causes them to feel anxious or distressed (Li et al., 2020; Marelli et al., 2021).

When students' OHSIB is contextualized in a pandemic context, many of them will be concerned about their current psychological functioning. According to a report, college students' mental health has deteriorated as a result of the pandemic (Galea et al., 2020; Khoshaim et al., 2020). Given that the Google search engine is capable of answering numerous questions about health and medical information every day (Strzelecki, 2020), students during the pandemic have grown accustomed to searching for information about their mental health and general well-being, with negative terms such as boredom, loneliness, worry, sadness, insomnia, depression, and suicide being the most frequently searched words (Brodeur et al., 2021; Misiak et al., 2020). Students, motivated by their desire to thrive in a troubled world, turned to online health information searches in order to maintain academic success.

Additionally, mental toughness may demonstrate its value in terms of students' online health information seeking behavior and thriving quotient. It has been suggested that online health information seeking behavior may serve as a coping mechanism for stress, ambiguity, and increased confidence regarding health concerns, as well as a means of preventing the spread of physical or mental health complications, thereby improving overall wellbeing (Oh & Song, 2017; Singh & Brown, 2014). When individuals develop mental toughness traits, they may develop a greater awareness of the negative consequences of their illness and complications. As a result, they are more likely to overcome their fears, act on available information, and survive the COVID-19 pandemic.

Conclusion

The current findings unequivocally establish a positive relationship between online health information seeking behavior, mental toughness and thriving quotients among university students in the Philippines. Simultaneously, mental toughness served as a partial mediator between the two constructs in the current study. Although the results indicated a partial mediation, it can be concluded that mental toughness can have a significant impact on students' online health information seeking behavior and thriving quotient, especially during the COVID-19 pandemic. As a result, it is critical to advocate for the inclusion of mental toughness in online health search that promote healthy personal growth and development. Additionally, this study demonstrates how having a healthy online information search has a direct effect on students' ability to thrive during the COVID-19 pandemic. The current findings may motivate future researchers to conduct additional research on the value of mental toughness and healthy online behavior in health and academic contexts.

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Comparative Study of Realistic Optimism between India and Japan University Students

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Abstract

This study aimed to determine the differences in realistic optimism between Indian and Japanese university students using the realistic optimism scale. Indian students (n = 361; 193 males and 168 females) and Japanese students (n = 390; 172 males and 218 females) participated in the questionnaire survey. A t-test and analysis of variance (ANOVA) were used to compare the realistic optimism between the two participant groups. The results of the *t*-test indicated significant differences between Indian and Japanese students regarding realistic optimism, with Indian students scoring higher in the flexibility and future orientation dimensions. No significant difference was observed in the will/courage dimension. The ANOVA results showed a significant difference between India's and Japan's male and female students regarding future orientation and flexibility. However, no significant difference was found in terms of will/courage between Indian and Japanese male students and between Indian and Japanese female students. The results also revealed that Indian students, male and female, scored higher on overall realistic optimism than Japanese male and female students. The findings are discussed in the context of cross-cultural studies. Indian students scored higher in flexibility resulting from a multicultural society that requires them to understand each other and be flexible. Indian students' higher scores in future orientation refer to a strong desire to realize their goals and dreams.

Keywords: comparative study, India, Japan, realistic optimism

Optimism is a broad concept that has attracted the focus of many scholars and researchers in recent times. Different researchers have defined it by focusing on its specific characteristics or perspectives (Carver et al., 2010; Scheier & Carver, 1987; Hanssen et al., 2014; Conversano et al., 2010). Furthermore, various researchers have introduced numerous concepts related to it. Some of the principal ones are dispositional optimism (Scheier & Carver, 1985), explanatory style optimism (Seligman, 1991), realistic optimism (Schneider, 2001), strategic optimism and defensive pessimism (Norem & Canter, 1986), and unrealistic optimism (Taylor & Brown, 1988).

Schneider (2001) defines *realistic optimism* as a realistic outlook toward the future that recognizes and accepts uncertain reality objectively. Schneider (2001) pointed out that the characteristics of realistic optimists are: (1) focusing on own favorable experiences in the past, (2) moving toward the future with hope while objectively recognizing and accepting reality, and (3) having the will and making efforts toward desired outcomes. Magari (2015) mentioned that the concept of resilience is at the center of realistic optimism.

As the optimism research pool has broadened, comparative studies between countries and cultures have also increased. Most comparative studies on optimism have been between countries, such as the United States and Canada, representing Western culture, and Japan, Korea, and China exemplifying Eastern culture (Heine & Hamamura, 2007; Klein & Helweg-Larsen, 2002). Moreover, a comparison that has been done the most is between East and West. There are, however, very few comparative studies that investigated the differences and similarities in optimism between two or more Eastern countries. This dearth may be because of the assumption that individuals from a collectivist culture are not much different in this regard because of a lack of separation of self from others (Higgins & Bhatt, 2001). However, it is vital to understand that there are significant differences even among Eastern cultures (and among Western).

This study compares the idea of realistic optimism among citizens of Japan and India, both of which are Eastern countries and collectivistic societies. The author aims to explain that two Eastern cultures may have various broad similarities, yet their ideas and concepts related to optimism could be different.

Characteristics of Optimism in Indian People

There are few papers that address optimism among Indian people. The work of Bharti and Rangnekar (2019) and Prabhu (2016) refer to optimism primarily from a Vedic point of view. According to Bharti and Rangnekar (2019), the concept of optimism seems to have been part of the belief system in India since the time of the early Vedic philosophy. Then, people believed that everything was possible through prayer, magic, natural forces, and cooperation with the gods. While interpreting the Vedas, K. P. Rao reveals that the ancient scriptures of the Vedas offer a sense of optimism and hope (Prabhu, 2016). The Vedas—meaning "knowledge"—have long been considered one of the oldest sacred texts of Hinduism. The existence of the concept during the Vedic period suggests that religious ideals are closely related to optimism (Prabhu, 2016).

Bharti and Rangnekar (2019) also refer to the optimism of Indian youth and state that, in general, young Indian people are more optimistic about their future and that of their society compared to the youth in other countries. Their work cites India's socioeconomic and technological growth and relatively stable political system as reasons for this.

In 2013, Joshi and Carter conducted a comparative study of the tendency toward unrealistic optimism among 200 middle-aged, middle-income Indians and 87 British citizens. They evaluated 11 favorable events, such as "winning the lottery" and "being healthy in old age," and 11 adverse events, such as "committing suicide" and "getting divorced," in terms of the likelihood of each event occurring in "their own life" and in the lives of "people like them." According to the results, Indian people showed a higher level of optimism toward negative events (adverse events will not happen to them) than the British population. Moreover, in terms of positive events, Indians of higher socioeconomic status tended to be generally optimistic, while those of lower socioeconomic status tended to be more pessimistic.

Sinha et al. (2000) assessed dispositional optimism and other psychological factors among college students from India and Canada. Unlike Joshi and Carter's (2013) results—and other similar studies—they find that Indian students were more pessimistic than their Canadian counterparts.

Characteristics of Optimism in Japanese People

Research on optimism has been conducted mainly from unrealistic optimism and positive illusion perspectives in Japan. *Positive illusion* is defined as "a belief about oneself that is pleasant or positive, and that is held regardless of its truth" (American Psychological Association, n.d.). For example, Markus and Kitayama (1991) find that the "self-enhancing bias" that is thought to underlie unrealistic optimism—in other words, the idea that one is better than others—is not universal. In cultures with a mutually cooperative view of self, such as Japan, self-enhancement bias is far less prevalent. Heine and Lehman (1995) studied unrealistic optimism in Canada and Japan; they found that Canadian university students showed high optimism in positive and negative items when tested using relative and absolute methods. Japanese university students showed unrealistic optimism only when asked about adverse events when tested using relative methods.

Studies point out that evidence of unwarranted optimism, or optimism bias, has also been found in Japan. Chang et al. (2001) found that optimism bias was present in the responses of both Japanese and European-Americans regarding the possibility of everyday adverse events. In addition, European-Americans hold an optimistic bias toward positive events, while Japanese have a pessimism bias toward positive events.

In Chang and Asakawa's (2003) study, respondents were asked about the possibility of experiencing an atypical event, compared to a sibling who is close to them, rather than other people or peers (e.g., classmate or colleague). The results show that European-Americans tend to have optimism bias toward positive and negative events. However, Japanese people tend to have no bias in either direction regarding positive events, while they tend to have a pessimistic bias toward adverse events.

Studies in Europe and the United States show that positive illusions are linked to good mental health (Shedler et al., 1993). However, studies on positive illusions in Japan do not show the same results; on the contrary, self-deprecation bias tended to be observed among Japanese people (Brown & Kobayashi, 2002).

Ito's (1999) study finds that, compared to others, Japanese people tend to overestimate themselves in terms of characteristics such as "kindness" and "seriousness."

According to Toyama and Sakurai (2001), Japanese people tend to be self-critical and selfenhancing. The reason for these different tendencies is that Japanese people's concept of selfdiffers depending on the nature of the situation or the characteristics of the people involved. Specifically, both positive and negative illusions are found in Japanese people. For example, positive illusions are found in aspects such as harmony and honesty. Conversely, negative illusions are found in ability, talent, sociability, and appearance, among other aspects.

All the studies mentioned above suggest that, in general, Japanese people tend to be less optimistic in comparison to western countries.

Research Methodology

The survey was conducted after obtaining approval from the Research Ethics Committee of the University, where the researcher was a student. After obtaining the participants' written and informed consent, the hard copy of the survey questionnaire was distributed to them in person.

Implementation of the Realistic Optimism Scale

The study used the realistic optimism scale, which was developed by Nishaat (2021). The realistic optimism scale consists of three factors: "future orientation," "flexibility," and "will/courage," and 12 items (Table 1). *Future orientation* can be defined as "the ability to step forward with a bright outlook for the future even when encountering difficulties." *Flexibility* can be defined as "the ability to change one's mind flexibly from various perspectives even when encountering difficulties. Furthermore, "will/courage" can be defined as "the ability to face difficulties head-on." These three factors are considered interrelated, influencing, and interacting with each other in a way that strengthens each factor. The scale was developed based on the idea of realistic optimism presented by Magari (2013). Magari (2013) defines *realistic optimism* as a way of thinking and living that allows one to have a positive outlook on the future, even when encountering various difficulties. The first factor, "future orientation ($\alpha = .83$)," and the second factor, "flexibility ($\alpha = .86$)" showed high internal consistency. The respondents of the survey were asked to answer on a five-point Likert scale, ranging from "Quite Applicable" (5 points) to "Not Applicable" (1 point).

Table 1

Realistic Optimism Scale

I Future orientation.						
I am living with goals for the future.						
I am living with a dream.						
There is hope in my life.						
I think difficulties or hardships are rewarding for self.						
I step up for things by myself.						
II Flexibility.						
Even if I fail, I am quick to recover from it.						
Even if I had an unpleasant experience, I move on immediately.						
I am not worried about small things.						
I am positive about everything.						
III Will/ Courage.						
I feel anxious and frightened even for small things. (R)						

I often tend to think about the past. (R)

If one thing goes wrong, I think that it will happen to other things as well. (R)

(R): Reverse-scored item

Survey participants

In India, 392 students (199 males and 193 females) from three universities in West Bengal, India, participated in this study. After responses that were incomplete or incorrectly completed were excluded, the completed questionnaires of 361 students (193 males and 168 females) were included in the analysis. The participant age range was 18–22 years.

In Japan, 423 students (191 males and 232 females) at three universities in the Tokyo metropolitan area participated in the survey. Of these, 390 students' (172 males and 218 females) completed questionnaires were included in the analysis, after incomplete or incorrectly completed responses were excluded. Participants were all between 18–22 years old.

Survey Period

The study period was from August 2019 to January 2020 in Japan and India.

Data Analysis

The Statistical Package for Social Sciences (SPSS) Version 26.0 was used for data analysis. An independent samples *t*-test and analysis of variance (ANOVA) were conducted.

Results

An independent samples *t*-test was used to compare the realistic optimism of Indian and Japanese students. Table 2 (with the graph presented in Figure 1) shows a significant difference between Indian and Japanese students in terms of the future orientation and flexibility factors

of realistic optimism and the overall realistic optimism score. Indian students had higher mean scores than Japanese students in future orientation (t = 10.98; p < .001) and flexibility (t = 7.95; p < .001). There was no significant difference in will/courage (t = .10) between Indian and Japanese students. There was also a significant difference between Indian and Japanese students in the overall score of realistic optimism, which tended to be higher among Indian students (t = 9.74; p < .001).

Table 2

T-test Results for Realistic Optimism Scores of Indian and Japanese Students

	Indian Students (N = 361)		Japanese	Students (<i>N</i> = 390)	<i>t</i> -value (<i>df</i> = 749)
	Mean	SD	Mean	SD	—
Future	4.35	.51	3.86	.70	10.98***
Orientation					
Flexibility	3.68	.81	3.17	.94	7.95***
Will/Courage	2.57	.92	2.56	.79	.10
Realistic	3.74	.45	3.36	.59	9.74***
Optimism					
(Overall)					

****p* < .001, **p* < .05

SD: Standard Deviation

Figure 1

Average Score of Realistic Optimism Between Indian and Japanese Students



A one-way analysis of variance (ANOVA) was conducted comparing students in the two countries by gender. Table 3 shows that there is a significant difference between the male and female students in India and Japan in terms of future orientation (F = 40.64; p < .001) and flexibility (F = 23.81; p < .001). There was also a significant difference in overall realistic optimism (F = 32.49; p < .001). There were no significant differences in will/courage between Indian and Japanese male students or between Indian and Japanese female students.

In terms of future orientation, the results showed that Indian males and females scored higher

than Japanese males and females (IF/IM>JM/JF, Mean: 4.40, 4.32, 3.83, 3.88, Mean difference: IF and JM: .55, IF and JF: .50, IM and JM: .49, IM and JF: .44, p < .001). In terms of flexibility, significant differences were found among all groups, with Indian male students having the highest scores and Japanese male students having the lowest scores. (IM>IF>JF>JM, Mean: 3.80, 3.54, 3.19, 3.13 Mean difference: IM and IF: .25, IM and JF: .60, IM and JM: .65, IF and JF: .35, IF and JM: .40, *p* < .001).

In terms of overall realistic optimism, the scores of Indian male and female students were higher than those of Japanese male and female students. Moreover, the Japanese female students' score was significantly higher than that of Japanese male students (IM/IF>JF>JM, Mean: 3.78, 3.69, 3.37, 3.36 Mean Difference: IM and JF: .41, IM and JM: .42, IF and JF: .32, IF and JM: .33, *p* < .001).

Table 3

FIndia Post-hoc Japan (*df*=3,747) Bonferroni test Male Female (N Male Female (N (N=193)=168) (N=172)=218) Future M4.32 4.40 3.83 3.88 40.64*** IF/IM>JM/JF Orientation (SD)(.55)(.45)(.77)(.65)Flexibility М 3.80 3.54 3.13 3.19 23.81*** IM>IF>JF>JM (SD)(.84)(.93)(.94)(.77)2.68 2.45 2.53 2.52 Will/Courage M2.42 n.s. (SD)(.91) (.91) (.76)(.76)32.49*** Realistic M3.78 3.69 3.36 3.37 IM/IF>JF>JM Optimism (SD)(.45)(.44)(.60)(.59)(Overall)

One-Way ANOVA for Indian and Japanese Male/Female Students (Realistic Optimism)

Note: IM: Indian Male; IF: Indian Female; JM: Japanese Male; JF: Japanese Female ****p* < .001

Discussion and Conclusion

The Japan versus India comparison of realistic optimism showed that the mean value for the factor of future orientation among Japanese students was significantly lower than among Indian students. A one-way ANOVA test by gender showed the same result. Both male and female Japanese students scored lower than male and female Indian students in the future orientation factor. Genda (2016) conducted a comparative study on hope in Japan, the United Kingdom, and the United States. He found that there was a significant difference in the level of hope. Most people in the United States and the United Kingdom want to achieve something in the future, while only about half of individuals in Japan held a feasible hope. These results are similar to those of the present study.

India is experiencing rapid, ongoing technological development. Young people, including students, desire to realize their goals and dreams. Japan, however, is already a developed country, with employment opportunities for almost everyone. It is a society where one can afford to live without having any particular goals or dreams. These differences may have been reflected in the mean differences in future orientation between the two countries.

Furthermore, the mean value of flexibility is higher among Indian students than Japanese students. Indians, who live in a country that is still in the process of development, must quickly adapt to various aspects of technological change in everyday life. This pressure may have led to a high level of flexibility. Furthermore, India is a multicultural country where people of different religions and cultures live in the same society. Therefore, it is essential to accept and understand each other's way of thinking to live in harmony in such a society (Sahgal et al., 2021).

This study showed that Japanese students had lower levels of overall realistic optimism than their Indian counterparts. This result is consistent with the results of previous studies. Japan was one of the ten countries with the lowest levels of optimism or positive expectations about the future, according to Gallagher et al. (2013). They examined the levels of optimism in 142 countries. In addition, a study comparing optimism levels in 22 countries shows that Japan had the lowest average level of optimism (Fischer & Chalmers, 2008). Similarly, a comparative study of optimism bias between Japan and other countries suggests lower optimism bias in Japan (Chang et al., 2001). In contrast, Joshi and Carter (2013) showed that Indian students had a higher tendency toward optimism, similar to the results of this study.

Compared with India, Japan is a developed country in terms of economy and society, and people accept this as the norm. So current status of economic development fails to create any enthusiasm or optimism in Japan. However, India is still in the process of development. Recently, Indians are gaining more confidence in themselves, as India is experiencing rapid economic development and improvement in their international status. These factors are likely to energize the seemingly underprivileged Indians and strengthen their optimism. Identical results have been published by the Pew Research Center, stating that developing countries are more optimistic than rich countries (2014).

In Japan, the percentage of students who attend higher education institutions (universities, colleges, and vocational schools) is 83.5% (Ministry of Education, Culture, Sports, Science and Technology, 2020). In contrast, the percentage of students who pursue higher education in India is only 27.1% in the 18–23 years age group (Department of Higher Education, 2020). Indian students take pride in having earned the opportunity to pursue higher education through fierce competition. This pride may be reflected by their higher levels of optimism compared to Japanese students.

There was no significant difference between Indian male students and Indian female students. However, at the same time, there was a significant difference between Japanese male students and Japanese female students, with female students tending to have higher levels of realistic optimism. This difference may be related to the mental strength of Japanese female students, who, while facing the harsh reality of male dominance in employment, are more future-oriented and hopeful about the future. However, further research is required to understand difference in optimism related to gender in Japan.

Future studies may address the limitation of the study. In this study, the target age group is the major limitation. The study collected data only from university students. However, to get a broader understanding of optimism in India and Japan, it will be necessary to collect data from other people at different stages of life, such as working people, retired people, and others, from both countries. Furthermore, the findings of this study call for a more extensive cross-cultural examination of both countries to get a complete picture of the optimism in both countries.

This research expands our understanding of the inherent differences in optimism among Eastern cultures. It will also help to clarify the reasons behind these differences.
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Immersive Research Experiences: Influences on Science Teaching Motivation and Practices

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Abstract

The push for inquiry-based learning in science classrooms has been met with anxiety and oftentimes low teaching self-efficacy among science teachers (Martin, et al., 2019). Professional development offers an opportunity for teachers to gain confidence through experiencing a real research lab. The current study investigates the outcomes of an extensive 8-week professional development program (N=8) on teachers' classroom instruction and explores the influential factors in instructional change. Focus groups and individual interviews were conducted to understand teacher's PD experiences. Three major themes emerged: model the actions of scientists, evidence of inquiry-based instruction, and evidence of self-efficacy. Professional development opportunities including an immersive lab experience, opportunities to build a learning community, and opportunities to feel like a student are influential to changes towards are more inquiry-based learning approach in the classroom and higher self-efficacy. When seeking opportunities for professional development for high school science teachers, school leaders and science teachers should search for key features that promote changes in the classroom leading to more inquiry-based learning.

Keywords: inquiry-based learning, professional development, research experience, science education, teaching self-efficacy

Teacher professional development has long been a remedy for many issues in education, however, there is dissension on the effectiveness of how it is implemented (Borko, 2004). Pressures for education reform often result in the push for the elusive solution of the professional development for teachers without clear guidelines on how, when, and to what extent it should be required and implemented (Thomson & Nietfeld, 2016; Borko, 2004). When the National Research Council (1996) suggested that science be taught in a way that is consistent with the scientific inquiry used within the field, professional development was the natural solution to getting science teachers up to par on national science standards. The standards outlined in the document suggested that students should be learning science in the same ways as real-world scientists would in their fields (National Research Council, 1996, 2000).

One major issue regarding the science education reform is that many science teachers had no prior experience in approaching science teaching in a way that was conducive to inquiry-based learning (Anderson, 2002; Thomson & Gregory, 2013; Crawford, 2007). They have become responsible for developing and facilitating innovative lessons in the classroom that fall outside of the typical pedagogical and methodological teachings of their teacher preparation programs (Bayar, 2014). Inquiry-based instruction requires access to resources, support from peers and school leaders, and overcoming barriers to deeply understanding science content (Johnson, 2006).

Professional development offers critical support to teachers by equipping them with tools, resources, and key experiences to overcome barriers in science teaching (Johnson, 2006). It has been shown to impact teachers' self-efficacy and classroom outcomes (Thomson & Turner, 2015; Klein-Gardner, Johnston, & Benson, 2012). The professional development experience detailed in this study is an 8-week summer program for high school science teachers who work in low-performing schools. The program is built on an immersive lab experience that allows for inquiry-based learning, mentorship, and networking. This current study reports on the data from one year of a larger, 5-year longitudinal study (Thomson, Roberts, & Hubbard, 2020). It aims to examine how professional development can influence teachers' science-teaching practices and beliefs about their capabilities. The study is guided by the following research questions:

- 1. In what ways do teachers' experiences from a summer immersive research mentorship program influence instructional practices?
- 2. What changes in teacher motivations (i.e., their teaching self-efficacy and values) are attributable to program participation?

Theoretical Framework

Social cognitive theory (Bandura, 1977) draws connections between learning and behaviors formed through, "reciprocal interactions; enactive and vicarious learning; the distinction between learning and performance; and the role of self-regulation" (Zimmerman & Schunk, 2003; Schunk, 2012, p. 119). Reciprocal interactions are described by Bandura (1982a, 1986, 2001) as a three-part cycle involving the person, their environment, and their behaviors. Figure 1 is a model interpreted from Bandura (1986) showing the nature of the reciprocal interactions. This model includes "science teacher" as the person, "teaching practices" as the behavior, and "research lab" as the environment in which learning takes place.

Figure 1

Reciprocal Interactions within Professional Development (adapted from Bandura, 1986)



When focusing on the relationship in the triad between the person and their behaviors "selfefficacy beliefs influence such achievement behaviors as choice of tasks, persistence, effort expenditure, and skill acquisition" (Schunk, 2012, p. 120; Schunk & Pajares, 2002). Selfefficacy refers to one's personal belief about one's ability to effectively learn or perform a task. It is not the same as one's actual ability to perform the task.

Both enactive and vicarious learning occurs without an explicit action completed by the learner. Enactive learning includes learning from the failures, successes, and consequences of others. Vicarious learning occurs through the observation of models, while not actually performing the task simultaneously. Models can take on many forms including in-person, symbolic, electronic, or in print (Schunk, 2012).

Social cognitive theory assumes that people engage in self-regulated behavior as they perceive themselves as having an agentic role in the performance of their learned behavior (Bandura, 1997). In regulating their behavior, people undertake actions that are likely to yield positive outcomes and abandon those that yield unrewarding outcomes (Bandura, 2001). Self-efficacy is pivotal to a person's sense of agency. Through self-efficacy and self-regulation, individuals evaluate their skills and capabilities to transform them into actions (Bandura, 2001).

Social cognitive theory, as a theoretical framework for this paper conceptualizes how teachers in this study learned through their immersive lab experiences, and how self-efficacy served as a catalyst for their changes to instruction when they returned to the classroom.

Literature Review

Inquiry-Based Learning in Science Education

Over the last several decades, science education reform has advanced inquiry-based learning and instruction as best practice for science learning and teaching (Anderson, 2002; Crawford, 2000; Johnson et al., 2020). This instruction involves "investigating questions and using data as evidence to answer these questions" and paves the path for students to understand the nature of science (Capps & Crawford, 2013, p. 498). Learning in this manner "should reflect the nature of scientific inquiry" (Anderson, 2002, p. 2). Inquiry based learning should "model the actions

of scientists", however, the extent to which teachers understand the actions of scientists presents a problem to implementation (Crawford, 2007, p. 614).

Barriers to learning any subject exist in each classroom and may depend on individual students and teachers (Crawford, 2007). When it comes to science learning and teaching, barriers preventing effective learning come from all sides including, lack of teacher experience and preparation in science inquiry (Capps & Crawford, 2013; DeCoito & Myszkal, 2018), low selfefficacy among students and teachers (DeCoito & Myszkal, 2018), and perception of support and school culture (Crawford, 2007). Many teachers have little understanding and experience in science inquiry and because of this limited experience, they find it difficult to navigate science inquiry in their teaching practices (Capps & Crawford, 2013). Crawford (2007) makes an important distinction that the difficulty in teaching through science inquiry is not at the fault of teachers, but may be largely caused by the fact that "researchers and teacher educators do not agree on what is meant by using inquiry in a science classroom" (p. 618).

Inquiry-based learning has been conflated with other terms like "doing science, hands-on science, and real-world science", all of which give a clear picture of the level of involvement required of students in their science learning experiences, but do not accurately capture the level of guidance in inquisition required to meet the students' learning needs (Crawford, 2000, p. 918). These conflated terms may derail teachers from truly meeting inquiry-based standards (Anderson, 2002; Crawford, 2007). Martin, Park, & Hand (2019) found that teachers beliefs about students learning science through inquiry and their choices in the classroom are sometimes at a disequilibrium resulting in science teaching that does not truly reflect inquiry-based instruction.

What teachers know and believe about science, teaching, and their own knowledge shapes their choices in planning and teaching in their science classrooms (Crawford, 2007; Martin, et al., 2019). A teacher's knowledge about science content or about teaching practices will "shape how the teacher might respond to student questions and inquiries" (Crawford, 2007, p. 615). People will avoid situations that they believe require abilities beyond their own; alternatively, people will "behave assuredly when they judge themselves capable of handling situations that would otherwise be intimidating" (Bandura, 1977, p. 194). For teachers who have little understanding of inquiry-based instruction, they are unlikely to engage their students in inquiry-based learning; therefore, increased self-efficacy in science content and pedagogy is necessary for high quality instruction (DeCoito & Myszkal, 2018). Professional development offers the opportunity to provide teachers with experiences to increase their self-efficacy.

Professional Development in Science Education

Traditionally, PD in science education has centered around introducing new curriculum and instructional materials, enhancing teachers' content knowledge, improving pedagogical approaches, or training about scientific inquiry (Wilson, 2013). Although widely established as a response to educational reform, PD programs have functioned without clear operational guidelines (Borko, 2004). Today there are a myriad of PD options available to teachers ranging from summer programs, school-based professional learning groups, and immersive research experiences to coaching and mentoring (Wilson, 2013), often differing in length (Supovitz & Turner, 2000).

Scholars have sought to identify the key operational components of PD programs that impact teacher learning and knowledge transfer. Borko (2004) asserted that PD programs must target

subject knowledge, understanding of student thinking, and instructional practices. Explicit attention to the subject matter and engaging teachers as learners in PD activities are particularly helpful to teachers building on knowledge independently. Immersive experiences where teachers are actively engaged with inquiry opportunities, as well as models of inquiry teaching, have been identified as critical turning points for teachers in PD (Wilson, 2013; Borko, 2004; Supovitz & Turner, 2000). An understanding of how students develop ideas and form connections are also critical components of effective PD (Borko, 2004). Wilson (2013) also reported that "focusing on specific content and engaging teachers in active learning" are general characteristics of effective PD (p. 310).

Borko (2004) provides a map of professional development in which teachers, the PD program itself, and facilitators are all within the greater context of the PD program, concluding that sound research would focus on the impact of each of these factors within the PD system. The overarching aim of the study is to examine each of these factors within the program we've designed. For the focus of this paper specifically, we aim to examine the impact of the program on the teacher participants.

Methodology

Study Context

The current study is part of a larger research project (Thomson et al., 2020) in which 5 cohorts of teachers over a 5-year timeframe participate in an 8-week summer immersive research program with a focus on environmental health science. The project, funded by the National Institute of Health (NIH) aims at increasing science teaching self-efficacy by equipping teachers with resources, experiences, and content knowledge relevant for incorporating inquiry-based instruction into their teaching practices.

The context of the PD program includes: immersion into a research lab, a mentor scientist/lab, guest speakers and lecturers, monetary compensation including funding for lab supplies for the classroom, access to university resources including world-class laboratories and libraries. Research labs from an environmental and human health research group at a southeast R1 university are recruited to be hosts and mentors for the 8-week summer PD program. Participants reported to these labs 4 days per week and spent approximately 8 hours in the lab during each visit. One day per week they joined together with the research team for guest lectures, collaboration, and focus groups. Within this group time, teachers were together with their peers and reflected on their experiences freely with one another.

Some teachers were partnered with labs that did not overlap with their course content. Within the labs, most teachers developed their own research questions, designed their study, and conducted the research and analysis under the close supervision of the mentor lab scientists and their graduate students. At the end of the PD, teacher participants produced a poster to showcase their research.

Research Design

A single instrumental qualitative case study design was employed following a bounded system approach as described by Yin (2014) and Creswell & Poth (2018). Only qualitative data were used (i.e., interviews and focus group) as we investigate the experiences of a single cohort of teacher participants (the 2018 cohort) in the summer PD program.

Participants

Participants in the summer program (N=8) were all certified high-school science teachers from public schools with many economically disadvantaged students. Participants' demographic data is presented in Table 1.

Table 1

Teacher Participant Demographic Features

Participant	Race/ Ethnicity	Gender	Yrs Teaching Experience	Subjects Taught
Dylan	AA	F	18	Biology, physical science, earth science, AP Biology
Gabi	AA	F	20	Anatomy, biology, physical science, forensics, AP environmental science, AP Chemistry
Jay	AA	F	4	Chemistry, Biology, Physical Science
Kori	W	F	3	Biology
Trey	AA	F	24	Chemistry, Physical Science, Physics, Earth Science
Pat	AA	F	5	Physical Science, Biology, Chemistry, AP Biology, Health, Biomedical Science
Rori	AA	F	4	Career and Technology Education, Environmental Science, Biology, Biomedical Science
Blake	AA	F	5	Physical Science

All teachers were female with a majority having teaching experience less than 10 years (only three teachers had more than 10 years' experience in teaching). Furthermore, seven participants identified themselves as African American and one as White Caucasian. Participants were recruited through emails and word of mouth from school administration. Some participants received an email directly from the PI on the project, others received the email from administration and other school representatives.

Teachers interested in the program applied via an online application. The following criteria was used in accepting applicants into the program: teachers that taught at schools with a higher free and reduced lunch percentage, teachers that had less than 10 years of experience in teaching science in high school classrooms, and teachers that expressed interest in conducting lab research. Due to the applicant pool in the first year of the project, teachers had a wide range of years of experience, from 3 years to over 15 years.

Procedures

Major qualitative data sources include open ended survey questions, online discussion and reflection forums, two focus groups, and individual, semi-structured, phone interviews. For the scope of the current study, major data sources are two focus groups and six individual semi-structured, phone interviews (see sample questions in Appendix A).

Focus group interviews

Focus group 1 was collected at the end of week two of the program and lasted approximately one hour. All participants were present and active for this focus group. Focus group 2 lasted approximately 30 minutes and was conducted in week eight. Only seven participants were present for this focus group as one teacher moved to a new state the week prior and was unable to attend. Both focus groups were conducted in rooms that were familiar to the participants and were moderated by the principal investigator and recorded by the research assistant.

Individual interviews

Individual semi-structured interviews were collected 3-4 months following their summer program participation, at the end of their first school semester. Two teachers never scheduled an interview, therefore, only six interviews were collected. These interviews focused on possible changes that teachers reported making in their teaching after participating in the program. Interviews lasted between 20-30 minutes for each participant and were collected by the research assistant and an additional graduate student advised by the principal investigator.

Data Analysis

The purpose of the focus groups was to understand the challenges, values, and experiences of the participants during the PD program. The aim of the individual interviews was to gain insight into individuals' reflection of their program experience as well as understand any changes made to their approach to science teaching. The purpose of data analysis was also to understand the connections between participants' experiences in the program with their self-efficacy in teaching science through inquiry-based instruction.

Focus groups and interviews were recorded and transcribed. All transcribed data were coded by two primary coders. Phase one of analysis used open coding to observe emerging themes that might collectively provide insight into the research questions (Merriam & Tisdell, 2015). Phase one presented approximately 100 codes that were then combined to account for differing codes that were describing the same type of data. In phase 2, axial coding was used group codes into themes while also using the constant comparative method, combining the cycle methods and open coding (Miles, Huberman, & Saldana, 2014; Strauss, & Corbin, 1998). Codes that did not directly apply to the research questions were eliminated. Three major themes emerged from the codes: focus on the students, teachers' self-efficacy gains, science teaching changes (see Appendix B).

Findings

The purpose of the current study was to understand how participants' experiences in the PD program impacted their science teaching, as well as changes in their teaching self-efficacy. Generally, teacher participants were excited to participate in the PD program and despite

challenges, left the program with a sense of pride in their work and research. Throughout the program teacher participants' focus remained on their students. Student engagement was a major motivation for applying to and completing the PD program for teachers. Teacher participants felt connected to their students as they were in a new role as learners. The continued focus became the first major theme of focus on the students. Participants' reported a renewed excitement for science and for teaching their science content. Even when teacher participants reported expecting low support from their school administration, they made notable changes to their science teaching instruction and overall beliefs about teaching science. Teacher participants' spoke about their confidence, excitement, enjoyment, and pride in their ability and work led the coders to the second theme of *teachers' self-efficacy gains*. Teacher participants largely expressed their belief in their own ability to be a scientist, even when they reported being certain they wanted to remain in education. The in vivo code "I did, so I know you can" served as a bridge from views of ones' self to views of students. Teachers were able to see themselves as scientists and researchers which resulted in changes to their own teaching practices. *Mimicking the actions of scientists* emerged as a sub-category, capturing the changes that directly mirrored their own lab experiences. Teacher participants served as a member of their host labs, allowing them to conduct real and meaningful research while learning about the process of science. Teachers reported mimicking this type of environment in their own classrooms. Allowing students to engage in science discovery, providing more hands-on opportunities, and emphasizing the process and nature of science research outlines the third theme of science teaching changes. Teacher participants reported their push to have students collaborate more, participate in more lab experiences, and to move away from "teaching to the test" or the use of worksheets. Our findings suggest that the way teachers perceive their selfefficacy is closely related to the way they implement their teaching. Their comfort and confidence with the science content is related to their willingness to let students have more control in their science classrooms.

Focus on Students

A key focus for participants was finding ways to update their curriculum to engage their students with science content. Rori described her experience with her own students saying,

I was just bored of the curriculum. I wanted a newer approach, too, because my kids hate science and I have to teach 35 kids who hate what I'm talking about the same thing over and over again and so I was getting stretched, my kids hated it. They would do other things in class and I was just like, 'what can I do to keep them engaged?', 'what can I do to make them like science?

The belief that students hated science was shared amongst several teachers as well as the motivation to change that reality for their students. Dylan recollected her motivation to join the program, stating,

I have issues with some students, you know, they just have a hard time with science. They think they either love it or they think it is hard and they get overwhelmed. So, I was looking for ways to teach science and make it more interesting to them so that they'll be excited about science.

Later in the focus group, Jay connected with the same frustration that Dylan and Rori shared about their own students' perception of learning science, saying:

In my experience like a lot of my kids hate it. It's too hard. Especially chemistry. It's too hard, how dare you tie math into a science. Like they just can't wrap their minds around it...they don't want to, but I think knowing that like, hey, I got to be a scientist for summer...and showing them all the different things that you can do in science and it's still called science and you can still feed yourself. I think that will bring more scientist to the field.

As the program progressed, teachers experienced frustrations with a different culture in the lab than in their classrooms, as well as a knowledge gap between themselves and the PhD level scientists. Being immersed into a science learning environment from a students' perspective meant that teachers were now able to connect with their students' perceptions of learning science. Teachers appeared to notice their own feelings in the student role as well as the scientist's responses to their questions and challenges. In essence, the mentors modeled key teaching behaviors as well as the scientific process, which teachers eventually incorporated in their repertoire of skills.

"I was in the same position as my students," Dylan explained as she spoke about how much patience her mentor lab had for her many repeated questions. As the teachers reflected on their experience, patience was a strong component of the culture of the lab, when facing the level of difficulty, they experienced during their research. This was also a key component of their newfound sense of patience for their students' questions. Dylan reflected on her experience of feeling like a student again saying, "So yeah, I also learned that I have to exercise patience with my students because a couple of things I had to ask over and over and my grad student was very patient with me". A similar experience happened to Jay as she described being a student for the second time with a different perspective, reflecting, "It was from a different point of view. Like I was thinking as a student and I was also thinking as a teacher".

Once teachers returned to their classrooms, their focus on the students remained a key motivator for the instructional changes they made. Dylan teaches biology, one of courses that requires students to take a standardized test at the end of the year. In her individual interview she shared a story about her students' test scores and their excitement about science content. She explained:

As far as my scores, they've always been pretty good, but I had to reflect on what the students need. If we want them to be lifelong learners, we have to teach differently, instead of like teaching just for the test...if we want them to have to have a career in STEM, we have to want them to have an interest in it, not just for the test. So I had some students come to me and asked me to be an advisor for Future Physicians of America, and I was like, honored. And I was like, 'me?' And they were like, 'yes'. So I said, 'okay', so now I'm an advisor for that and we had our first meeting and again, I let them run it. I'm just there, you know, they need an adult presence. So I'm excited about that and I'm just doing more student-based learning so I cannot be exhausted at the end of the day.... more inquiry-based learning and things like that, instead of the way I used to teach.

The shift from maintaining positive test scores to addressing student interest was a commonly shared motivation among teacher participants.

Teaching Self-Efficacy Gains

The coding process brought about several sub-codes including, "resources", "confidence", "relevance", "contributions to the field", and "pride in one's work". These codes comprised the major theme of "teachers' self-efficacy gains". Simply having access to resources does not show evidence of self-efficacy, but the knowledge of how to use new resources suggests that teachers are more prepared for unexpected questions during their instruction. Because teachers spoke about access to resources and it overlapped with data that included feeling more prepared for teaching, "access to resources" was included in this theme.

When asked about her emotions after completing the PD program, Dylan explained, "when I did my poster, I was really proud of it" and in fact, she shared it via social media, with her mother, and with her school administration. Jay had a similar experience of pride as she reflected on the difficulty of the program explaining,

I think this summer, it was tough... but when we had that last meeting and we had the big poster presentation, like the relief and I mean, it just all came full circle....it was just so worth it. And just to see how hard everybody worked and, you know, how much time and effort. I mean, it was just one of those things where you're just like, okay... I was here for a reason... and I wouldn't have traded it for anything else.

Jay's sense of accomplishing a difficult task provides evidence that her self-efficacy in conducting scientific research, learning, and teaching science has increased. Prior to becoming a science teacher, Rori worked at a bank. During her interview she reported that she had no real training and had to learn how to teach science on her own. Rori spoke about changes in her views towards herself and science teaching explaining,

I feel like after the program, I'm just more excited about the subject. I'm more excited about the content. I'm more excited about environmental science as a whole. And so, with that excitement I'm able to challenge myself first of all, and I'm able to challenge my students better...I'm like much stronger, not only in the content, but I feel, um, I feel more knowledgeable at teaching.

Additionally, Gabi viewed her experience with pride as she mentioned this experience would serve as an excellent resume builder. She also referred to the resources explaining the immediate relevance and utility of these resources.

When asked, "do you think you can be a scientist?" teachers' responded with a variety of emotions. Blake, Dylan, Jay, and Gabi all reported that though they have proven they are capable of the work, a research lab is too quiet to be fulfilling to them long term. Trey mentioned that after retiring from her teaching career she would be interested in working in a research lab. Pat, Rori, and Kori all expressed interest in furthering their careers in science by going back to school. Pat reflected on her experience in the program stating that "Getting up and going to a lab every day, I had a great time. I'm looking for a PhD program now because you all have really kind of got my wheels turning in my head now. So, I do want to find another program."

Though their aspirations in scientific research differ, the teachers all left the program with a sense of pride in completing the program and knowing that they can conduct research.

Instructional Changes

As teacher participants continued to focus on the students in their science classrooms while being immersed in a science research lab, ways of incorporating the process of science began to emerge in conversations. Additionally, once returning to their classrooms, teacher participants spoke about applying what they'd learned in the labs to their own classrooms. The coding process brought about two major sub-categories that make up the theme *science teaching changes*: mimicking the behavior of scientists and changes to practice. Mimicking the actions of scientists and science teaching changes coincided during the coding process and were therefore combined. This theme captures teachers' emphasis on the process of science in their classrooms, the implementation of aspects from their lab experience into their classroom, and the general experience of being a scientist including disappointments, discoveries, and collaboration.

After their PD experience, teachers returned to classrooms. The choice to make any changes was entirely up to them. Knowledge and skills transferred from the PD program are represented by teachers' reports of a post PD-participation shift in their instructional styles or strategies.

Trey, one of the teachers, summarized her thoughts about her science teaching by saying, "I think that by this experience we've actually come up with some ways to alter or change or add into what we already have in the classroom". Teachers consistently reported making changes in their classroom to accommodate a "more hands on" approach. Dylan reflected on her previous approach to classroom management that consisted of keeping more control of her classroom, but after her PD experience she committed to, "being more intentional with the students being more in control of the class". She explained that her approach to questions in her classroom has changed and that she's, "making them think now on a higher level", by not simply asking for a correct answer, but asking "why did you choose that answer?". When asked about her overall experience in the lab, Dylan responded, "I enjoyed learning. Again, I'm reinforcing the scientific method part". Her challenge to her students to think beyond the correct answer and her reinforcement of the use of the scientific method are consistent with her own lab experience. Other teachers had a similar view on teaching science and shifted to approach science through a hands-on experience. Rori explained her shift in teaching practices saying,

Most of the stuff in the class is hands on now. I have gotten away from trying to just get my kids ready for the exam because I've found that being that strict, being that rigid, that tough on students does not help them at all.

Kori had a similar experience when she returned to her classroom explaining "one of the big things that I did this year was I really looked at my curriculum and I ensured that I was doing as many labs and activities as possible. So, by this time last year I probably had only done about four labs and this time this year I've done eight". Further, Kori explained that she was also emphasizing more about, "why those procedures are important" and stressing the need to understand the scientific process so that they can analyze experiments and their results. Adapted from her own lab experience, she emphasized the methods her students use to better understand the nature of scientific research. Additionally, she reflected on her values from the program stating, "So for me it was just a better understanding of the scientific method on a larger scale and how I can apply that to the small scale we do here". Gabi's approach to her classroom mirrored her experience in the lab as she stated, "they're going to do a research

project like the one that I have". Her approach to her classroom assignments suggest that she is modeling the nature of scientific inquiry that she learned in her lab experience.

Another change to teaching practices included collaboration with one another to eliminate cheating. After a presentation on research ethics outlining consequences for plagiarism, Trey was inspired to take the same approach in her own classroom. She explains,

"The idea that I want to steal is the whole "retracted" idea because if your data matches this group, "retracted!" You know. You get a stamp and you're going to get the lowest possible passing grade on that particular lab because that's what they're doing in the real world. So, they need to start learning this at a younger age and that's something that I'm going to put in my syllabus".

Kori also emphasized collaboration without copying in her classroom as she adapted her own lab experience to fit her classroom. She explains her new approach, saying,

"I do more discussions and do more student-centered interactions and discussions than I did last year. um, so, you know, a little bit more lab work, teamwork, collaborative work, which was something that was required and when we did the research. It's not really just a one-person effort, especially whenever you're doing tests every single day. It always requires somebody else's input, somebody else's help. So that was something that I was able to incorporate more into my setting."

Overall, teachers were proud of the work they accomplished during their PD experience and made meaningful changes to their science teaching practices.

Discussion

The three major themes capturing the key findings in our study reflect how teachers gained more teaching science efficacy, made instructional changes to their teaching, and focused more on helping students develop academically. These findings answer the proposed research questions by providing an indication that teachers made various types of changes (i.e., instructional, motivational), due to their immersive science mentorship program engagement.

Throughout the PD experience, teacher participants' focus remained on their students. This focus ranged from connecting with their students' experiences to imagining ways to bring their lab experience back to their classrooms. Teacher participants remained motivated to providing relevant experiences for their students. Many teachers were inspired to change their teaching practices by experiencing learning through their students' perspectives. This finding of understanding student thinking is consistent with Borko (2004) suggestions of meaningful professional development experiences.

Through immersion in a research lab, teachers were provided with models of how science inquiry happens in the field. The overall PD experience presented many challenges to each of the teachers. One of the most common challenges was the difference in knowledge base between the teachers and the scientists. Overcoming these challenges led to more confidence in the research labs as well as more comfort with the scientific process. As the teachers' knowledge and experience in the lab increased, questions were viewed less as a distraction and threat and became more of the guiding practice of scientific learning. These results are consistent with Bandura's (1977) theory of self-efficacy stating, "efficacy expectations

determine how much effort people will expend and how long they will persist in the face of obstacles and aversive experiences. Those who persist in subjectively threatening activities that are in fact relatively safe will gain corrective experiences that reinforce their sense of efficacy" (Bandura, 1977, p. 194). Once teachers understood what it was like to be in the position of the student who asks questions, they were more inclined to welcome these questions and use them to deepen their students' inquisitiveness. This was all modeled by their host labs and supports that vicarious learning and having models is incredibly influential in teacher professional development (Schunk, 2012).

Teachers were supplied with many new resources that were relevant to their teaching and to their students. These resources and the knowledge of how to use them provided teachers with the knowledge they needed to answer questions or to challenge their students to dig deeper to find their own answers. Having access to resources and relationships is a requirement to inquiry-based instruction (Johnson, 2006).

After returning to their classrooms, teachers described their teaching approach as "more hands on". Simply being "more hands on" does not necessarily mean they were using inquiry-based learning, however, their emphasis on the scientific method, understanding the process, letting questions guide the learning, and investigating phenomena are all evidence of inquiry-based learning (Crawford, 2007). Furthermore, the teachers increase in lab and activity engagement, as well as letting students have more control over their learning is further evidence that teachers are using inquiry-based instruction and suggests they are "modeling the actions of scientists" (Crawford, 2007, p. 614).

Limitations and Ethical Considerations

In this study, teachers reported the changes made in their teaching practices. Research did not include observations or more empirical evidence of these changes. Demographic information was collected in the surveys and interview questions. The research questions do not directly address how one's race, ethnicity, age, or socioeconomic status play into their beliefs about science teaching, therefore, these aspects were not included to avoid further marginalizing these identities. Participants were paid a stipend for their participation in the program issued based on participation and attendance in the program. All participants were made aware of this at the beginning of the program.

Recommendations

This research adds to the growing body of research surrounding science education reform through the professional development of science teachers. Teacher professional development can be an incredibly influential experience for science teachers when it involves opportunities to learn from scientists who model scientific inquiry, it lasts long enough to see their own growth, and it provides resources for their success in the classroom. To see the impact of professional development, long-term, immersive experiences offer a great chance to see real changes in scientific teaching. The future of STEM careers starts in the science classroom, but if our teachers are not confident in their subject, our students may struggle to connect to the material (Thomson & Gregory, 2013; Thomson, Huggins, & Williams., 2019). When school districts and administration can send their new science teachers to meaningful professional development experiences, they should support this endeavor. For teachers who are struggling with science content and instruction, long-term professional is an influential experience resulting in better practices in science teaching.

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Appendix A

Sample questions from interview protocol

1. Describe a little bit your science teaching efficacy:

a) before and after your PD program.

b) at the present time: How confident are you now about your science teaching related to the EHS topic?

2. What do you consider to be the most valuable about your participation in the EHS program?

3. Can you talk a little bit about your emotions *before* and *after* your EHS summer PD program?

4. Please describe what changes in your teaching practices you made after attending the EHS

program and how the EHS program provided the impetus for you to make these changes. 5. In what ways does your school and district provides support for you to implement in your

teaching the knowledge and skills you gained from attending the EHS program?

Appendix B

Coding scheme with major themes and codes

Themes	Codes/Sub-codes	Description	
1. Focus on the Student	 1.1 Student desire/interest/needs 1.2 Students' perceptions of learning science 1.3 "Absolutely, my students can be scientists" 1.4 Proof to students 1.5 Student Initiative in learning science 1.6 "I was in the same position as my students" 	Participant's motivation for completing this program, focus on student interest in science learning, seeking ways to further engage students in science learning, beliefs about students' ability to learn and do science, connecting with students' role as learner	
2. Resources	2.1 "Something to take back"2.2 Relevant research2.3 Relationships built	Exposure to equipment in the lab, exposure to relevant research, tangible resources to take back to classroom, network of people as resources	
3. Frustrations in the program	3.1 Lab Culture Vs ClassroomCulture3.2 Boredom in the Lab3.3 Payment Misunderstandings3.4 Steep Learning Curve	Expressed frustrations during the program	
4. Mimicking the behavior of Scientists	 4.1 Acting like Scientists 4.2 The process of science 4.3 Collaboration in research 4.4 "Real authentic research" 4.5 Comfort with starting over 4.6 Comfort with more questions 	Practicing the scientific method, strict lab procedures, encouraging collaboration, and following the nature of scientific research "when I got through with my experience with my experiments like the data wasn't significant even dr. Reid was like man I was hoping that we could find something sometimes you just don't end	

		up with anything and you just have to start over and look at something else a different Locus"
5. Teacher efficacy gains from Program	5.1 Confidence5.2 Comfortable5.3 Pride in one's work5.5 Excitement towards science	Expressed confidence, comfort, and excitement with science content, research, and teaching science and sense of pride in completing the program.
6. Changes to practice	6.1 More hands on6.2 More patience for student questions6.3 Students guide learning6.4 former teaching practices	Changes to science teaching practices after PD program, reference to former teaching practices
7. Perceived low support from school	7.1 School administration is disconnected from classroom7.2 School administration is focused on other things7.3 focus on scores	Participants' expressed perception of school administration not focusing on the experience of students in science classrooms and only focusing on scores, a belief that support only comes for tested subjects (i.e. biology)
8. Science as a future career	8.1 Resume builder8.2 Seeking higher degree8.3 Future aspirations	Participants thinking about their future possibilities in science and science teaching.

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