

POSITIVE AFFECT FOR CONFINED FITNESS SPACES

Maximizing Positive Affect for Confined Spaces Without Natural Light

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Abstract

This study looks at maximizing positive affect for confined spaces without natural light. This study aims to address the challenges faced by the fitness facility that lacks natural light and high ceilings. Through analysis of the literature we have found that the two most prominent features in a fitness facility setting are lighting and mirrors. Both the use of mirrors and lighting create a positive effect to a potential fitness facility user. These factors led us to hypothesize that the implementation of brighter lighting and more mirrors will create positive feelings for potential users. To test our hypothesis, we created a survey that consisted of two parts. Our first section consisted of identifying demographic information on our participants, as well as some underlying knowledge of their fitness exposure. The second section was the test phase, where we had participants choose between images that displayed are independent variables, which are lighting and mirrors. We found that participants preferred images of fitness facilities with brighter white light and more mirrors over those without either at a significantly higher rate.

Keywords: fitness, lighting, mirrors, positive mood, wellness.

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Research Question and Hypothesis

The research question we are exploring is: what interventions can be used in workout spaces without natural lighting to enhance user experience? There is an importance in considering these interventions since there is a functional link between aesthetic features of environments and exercise benefits (Hug, Hartig, Hansmann, Seeland, & Hornung, 2009). Through the review of the literature we have encountered two interventions that appear to be effective in enhancing a windowless environment with lower ceilings. The first intervention we have found is the strategic placement of mirrors, “In their guidelines, the American College of Sports Medicine has recommended that exercise rooms have mirrors on at least two of the four walls in the facility” (Chmelo, Hall, Miller, & Sanders 2009). Another reason that mirrors are important in contemporary exercise environments is that they are largely designed to provide considerable visual feedback to participants (Katula, McAuley, Mihalko, & Bane, 1998). Again Martin Ginis, Burke, & Gauvin, 2007 stress that an environmental characteristic that has gained more attention in regards to its effects on acute responses to exercise is the presence of mirrors. It has been found that active people do experience increased energy, even in environments that could potentially undermine the benefits of physical activities like group mirrored settings (Martin Ginis, Burke, & Gauvin, 2007). These studies stress the importance and benefits of mirrors within a fitness facility in making a positive contribution to user affect. A second intervention that has been broadly studied on its positive affects on the productivity and mood of individuals is lighting. A study done by Heerwagen, & Orians, 1986 found that some of the sensory and perceptual deprivations of windowless conditions may be overcome using amenities as variable lighting design and perceived spaciousness with the use of mirrors. Bright lighting may also improve various physiological functioning and change the mood of clients (Shaulov, & Lufi, 2009). A study done by Izso, Lang, Laufer, Suplicz, & Horvath, 2009 also find that lighting effects were found to affect psychophysiological parameters like skin conductance response which was sensitive to changes in lighting. There is also strong evidence to suggest that the visual environment like lighting in indoor fitness facilities have beneficial effects for all user groups (Salonen et al., 2013). Lastly the exposure of illumination levels is important to mental wellbeing and bright light exposure indoors can increase the level of vitality, sleep quality, physical activity, energy level and social activities (Grimaldi, Partonen, Saarni, Aromaa, & Lönnqvist, 2008). Taking into consideration all of these findings, we hypothesize that the implementation of brighter lights as well as the use of more mirrors in a fitness facility with a low ceiling and no natural lighting will create positive feelings for potential users.

Methods

Our research design consisted of a two-part survey. The first portion was to collect demographic information on our sample to see how the importance of exercise in their lives and how often they participate in physical activity, effected their responses. The second portion of our survey was a test phase that asked our participants 8 questions. Each question required participants to choose between two images of fitness facilities that differed in our independent variables. We came up with the questions for the first set of our survey by keeping in mind what the client might want to know about the target population for the new fitness facility. The images

we chose for the second part of our survey, the “test” phase were found online. We searched Google for images of fitness facilities that exemplified the criteria our client gave us about the facility we are working with and found images of real-life facilities.

Participants.

Our participant population consists of UBC students as well as some staff. We targeted University students. We sent out our survey to members of UBC Sororities, UBC fraternities, UBC REC members, fellow classmates and some members of graduate studies within UBC. Our sample includes 62 participants. 95.2% of our sample are within the ages of 17-33 and 4.8% of our sample is 33 or older. N=62.

Conditions.

Our independent variables are mirrors and lighting. Our dependent variables are the users subjective rating of the images they would prefer to work out in. We operationally define these variables into the following categories; Mirrors: more/ some/ none. For lighting, we varied the type to brighter, fluorescent, or less/ dimmer. To test these variables, we have included images of health facility layouts that include the lighting and mirror variables at their different degrees. Our independent variables will fall into three conditions. One should invoke positive affect, more desirable, one should be less desirable, and the other will be a control, therefore participants should not prefer one over the other. The control images have been matched in our variables to see if there are any other factors that may be affecting our participants’ choice when the lighting and mirrors are matched.

Measures.

Our measures consist of a survey we created using Google forms. It consisted of two parts. The first portion contains questions to collect demographic information about our population. The demographic questions asked participants for their age, if they exercise, how often they exercise, fitness goals, place of exercise, how important exercise is to them, if they think they get enough exercise, where they would prefer their fitness facility to be located, and what three factors are the most important to them in their ideal fitness facility. The second portion is the test phase to see which gym scenarios appeal to our participants more. The test phase of our survey consisted of 8 questions. Each of the 8 questions asked our participants to choose between two images with the prompt “For the following images you see, choose which fitness facility you would prefer to work out in”. The images were chosen on the criteria that they matched the description of the space we would be working with that our client gave us. This included lower ceilings and no windows. We wanted to find images of already existing gyms that could give off a similar look and varied in terms of how many mirrors if any and types of lighting used. Two of the test questions were controls, two of the questions are direct inverses of both our independent variables two questions tested for differences in mirrors two tested for differences in lighting. Upon collection of data, we were able to download all results from Google Forms into a Microsoft Excel Spreadsheet which then facilitated easy upload into the given data analysis software, JASP.

Procedure.

Our participants were emailed a link to the survey and instructed on how to complete it. They filled out the survey on their computers or mobile devices. Our link was shared with undergraduate research assistants, graduate students, members of fraternities and sororities as well as other students and some staff at UBC. We ran our survey for one week. Upon

completion of the survey, members of our group were notified via email that an individual had completed the survey.

Results.

In the demographic part of our survey we found that: 95.2% of our participant's exercise N=62. 80.7% exercise at least once a week or more, 54.8% exercise in a gym and 21% From another fitness facility (e.g. yoga studio, spin places, climbing gyms etc.) Other respondents reported they participate in physical activity from home or outside. When asked how important exercise is to our participants 75.8% of them rated it as 4 or 5 on a 1-5 scale (Rating 1 as Not at All Important and 5 as Extremely Important). 33.95% of Likert participant's report maintaining good health as their top fitness goal followed by 29% who state that weight loss is their fitness goal, and 24.2% state that staying active is their fitness goal. Despite the fact our participants report exercising quite frequently 64.6% of them report getting somewhat- slightly too little exercise and 21% stating they get much too little. When asked, "what are the three most important aspects of a fitness facility to you?" the most commonly coded answers were: cleanliness, lots of space, diversity/ quality of equipment, location, and accommodating hours. Lastly majority of respondent's report that their preferred fitness facility be closer to home followed by closer to work and school. Convenience was a key factor in potential fitness facility.

To analyze our test questions, we ran a Binomial test using the software JASP, since our questions each had two categories that could be equally likely to be chosen. We did a one sided test so our alternative hypothesis specifies that the proportion is greater than 0.5. We found that when comparing images with more mirrors and brighter lighting to those with less or no mirrors and dimmer lighting our participants went with the brighter lighting and more mirrors at a significant rate. A binomial test indicated that the proportion of participants of .806 was higher than expected, $p < .001$ (1-sided) for question 1. We saw a similar pattern in results for questions 4, 6, and 7 which all yielded a $p < .001$ (1-sided) indicating a clear preference for one response over another. These results can be viewed within our appendix. Our control questions which were questions 3 and 8 worked as controls showing that when matched in lighting, mirrors, equipment and space participants do not have any preference on the color of the facilities. The colors in our images were either dark or light for the respective gyms. The proportion of participants for question 3 was .484 for option 1 and .516 for option 2. This is very close to an almost 50/50 split. For question 8 the split was not as but close enough with the proportion of participants for option 1 being .419 and for option 2 being .581. In question 2 we found that participants preferred the space with more lighting but there are some confounds in the images we used since option 1 had fitness machines in it and option 2 did not. Since our participants rated equipment as their top aspects they perhaps had this majority for option 1 since it contained workout equipment as opposed to option 2 which is a free space. In question 5 we found too many mirrors was a deterrent for participants and with cluttered machines versus an open cleaner space. These results correlate to our survey findings of what people desire in their preferred workout spaces, which is a larger space.

Discussion.

To construct this project, we discussed what our client wanted us to look for as an intervention to the challenges faced by the architectural design of the space we are working with. Our client was very receptive to our ideas and open to a lot of possibilities that we could consider to make this space more effective. Since the paint color of the facility was already chosen we considered other design elements that could impact the facility in a positive and user friendly way. Through analysis of the literature we concluded that lighting and mirrors were aspects of

fitness facilities that impacted users' moods, activity, and wellbeing. The purpose of collecting demographic data and having the first portion of our survey be a questionnaire is to create a baseline of what our participants' attitudes and existing exercise habits are. We were surprised to see that the majority of our participants exercise regularly and at a gym because this influences their subjective ratings of the images that followed in our test phase. We used these responses to help understand our data outcomes. Since our participants seemed overall active and their knowledge on fitness and experience with physical activity helped to gauge their ratings, as they had pre-existing knowledge in fitness facility layout. This was necessary since we have a few limitations to our study. Firstly, we did not have access to the facility our client has, nor any photos of it, just a description. Secondly, looking for images to model the space our client is working with was challenging since already created fitness facilities are typically built or put into places that have ideal features like windows and high ceilings. Thus, some of the images we found online modeling the fitness space we are working with are not all equal in appearance and variables. Some had TV monitors, exercise equipment, larger ceilings than our ideal space, and some had individuals in them. The reason that we still chose to work with these imperfect images is because, firstly, they are already existing fitness facilities. Secondly, they did display our independent variables. Lastly, we did not want our participants to catch onto just one feature being portrayed over and over again. One method we used within our study to see if our images may have been confounded by our limitations was through implementing control questions containing images that were essentially equal. These controls proved to be quite effective. The control questions were 3 and 8 and their split was relatively even. Another limitation to our study is that we made our survey quite short, and could have asked more questions but our initial goal was to create a shorter survey to gain a higher sample size and to have participant's eager to participate in the survey. For the purpose of this research we aimed for a simple, succinct design. Our simple design aided in easy data analysis and straightforward results. If we were to replicate a study like this, we would create a larger survey asking more questions about individual's fitness habits, and goals as well as their desired fitness space, including things such as music, ambiance, etc. Another thing we could have done, is create our own stimuli by perhaps finding a facility we could make adaptations to. For example, using someone's basement gym and adding or taking away mirrors or dimming and brightening the light. Overall our results are conclusive with our hypothesis and we did find that people prefer the slightly brighter spaces with more mirrors over spaces with less lighting and less mirrors. The color of the fitness facilities had no impact of our participants' choices. The spaciousness, amount of clutter in the gym as well as newer equipment impacted participant ratings.

The importance of this research is to help in overall wellbeing. Physical activity is seen as beneficial for physical, psychological, and social health (Hug, Hartig, Hansmann, Seeland, & Hornung, 2009). It has been found that enhanced physical environments may create a positive atmosphere, enhance communication during exercise and potentially improve exercise performance, compliance and perceived well-being (Sandal, Thorlund, Ulrich, Dieppe, & Roos, 2015). Having a space on campus for students/ campus users to engage in healthful behavior is important. There are many positive benefits to exercising, it has been investigated as a behavioral countermeasure to facilitate circadian adaptation, which we all know getting proper sleep as a student is important to overall health (Barger, Wright Jr., Hughes, & Czeisler, 2004). Our findings based off our participants' rating on lighting has also been found by Knez (1995), when testing participants' mood doing tasks and exercising he found that the 'cool' white color temperature at low illuminance and the 'warm' white color temperature at high illuminance

preserved best the positive mood in subjects. These findings are respectable since our intention was to evoke a positive mood within our participants so that it would aid them in the selection of our options. Another study found that bright light exposure indoors can increase the level of vitality, quality of sleep, physical activity, energy level and social activities, while it decreases the intensity of depressive symptoms even in persons having no seasonal changes in mood or behavior (Grimaldi, Partonen, Saarni, Aromaa, & Lönnqvist, 2008). This same study's findings also suggest that illumination levels indoors are of importance to mental well-being (Grimaldi, Partonen, Saarni, Aromaa, & Lönnqvist, 2008). These studies imply the importance of lighting within a fitness facility and its impacts on mental health, mood, and well-being. Our study aligns itself within this literature finding that although the lighting in our images was not made salient it did in fact influence our participants' choices significantly showing there is a preference for brighter than average light. This study can be applied to a larger population of people who engage in exercise within fitness facilities and perhaps subtle changes like the lighting can make a larger impact than expected benefitting this population in a positive way.

Recommendations for UBC Client

Based on our data and analysis, we found that the use of mirrors and bright light is a feature that is desired by participants of our study. This helps out client in gauging the direction they want to flow into. Upon research our client wanted to find out whether lights and mirrors created a positive mood and motivation in potential users. We also found that the use of paint was not a large determinant of desired intervention strategies for our fitness facility. Lastly, we found that the type of equipment played a factor in participant's responses, favoring the usage of newer equipment and machinery equipped with the use of TV monitors, USB cables and docking stations. Our first recommendation to our client would be to take into consideration the three most widely and commonly desired aspects of a fitness facility, which are: equipment, space and cleanliness. Other factors that were common feedback within our study was the implementation of an affordable membership as well as convenience to commuters on campus. Our second recommendation is the usage of brighter lights, as well as the strategic placement of mirrors to give the illusions of a larger space and the use of new and advanced machinery.

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Appendix

Binomial Test

Binomial Test

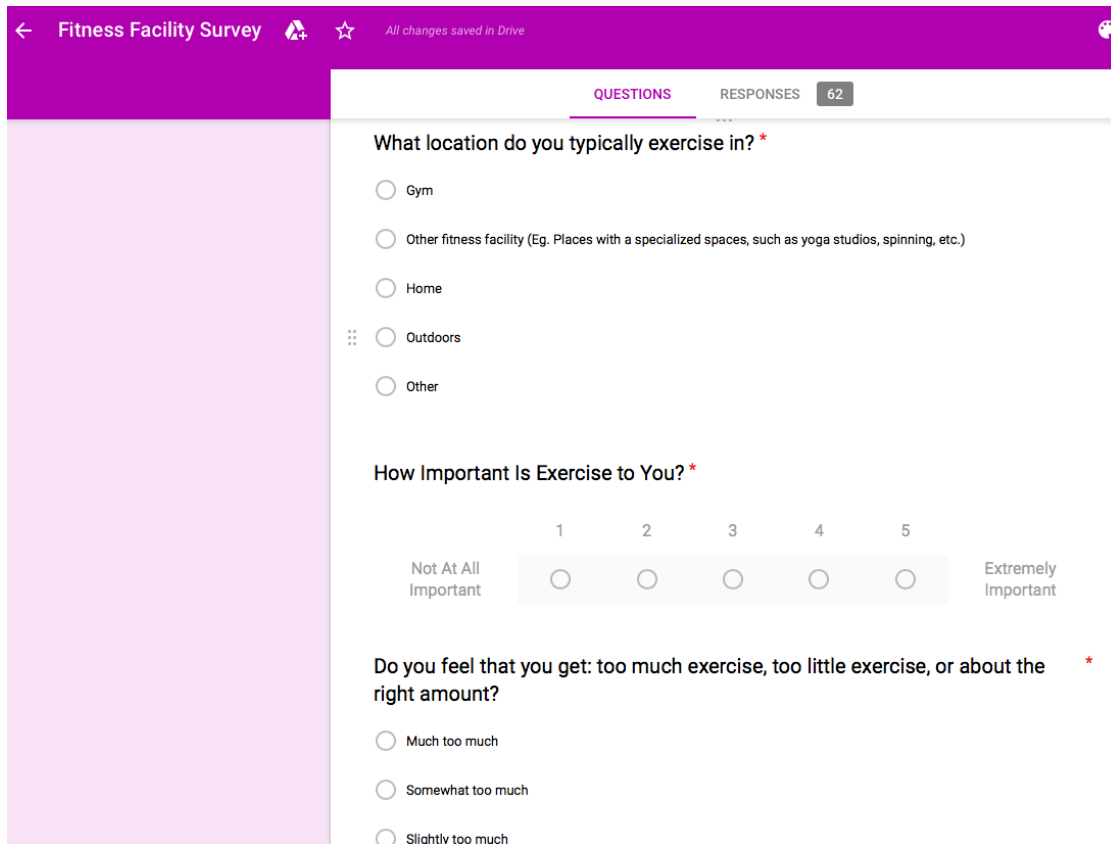
		Counts	Total	Proportion	p	95% Confidence Interval	
Level	Lower					Upper	
Question 1	Option 1	12	62	0.194	1.000	0.116	1.000
	Option 2	50	62	0.806	< .001	0.705	1.000
Question 2	Option 1	42	62	0.677	0.004	0.567	1.000
	Option 2	20	62	0.323	0.998	0.225	1.000
Question 3	Option 1	30	62	0.484	0.648	0.374	1.000
	Option 2	32	62	0.516	0.450	0.405	1.000
Question 4	Option 1	46	62	0.742	< .001	0.635	1.000
	Option 2	16	62	0.258	1.000	0.169	1.000
Question 5	Option 1	20	62	0.323	0.998	0.225	1.000
	Option 2	42	62	0.677	0.004	0.567	1.000
Question 6	Option 1	17	62	0.274	1.000	0.183	1.000
	Option 2	45	62	0.726	< .001	0.618	1.000
Question 7	Option 1	46	62	0.742	< .001	0.635	1.000
	Option 2	16	62	0.258	1.000	0.169	1.000
Question 8	Option 1	26	62	0.419	0.919	0.313	1.000
	Option 2	36	62	0.581	0.126	0.468	1.000

Note. For all tests, the alternative hypothesis specifies that the proportion is greater than 0.5.

This is a link to our survey: <https://goo.gl/forms/ezs7ChLauq1w9DDW2>

We have opened responses so that you could take a look at if you you'd like.

Here are some screenshots of our survey questions:



What are the three most important aspects of a fitness facility to you? *

Short answer text

In terms of location, where would your preferred fitness facility be located? *
 (Eg. closer to home, at school, near the grocery store, etc)

Long answer text

Section 3

Choose the gym that you would prefer to work out in from each set of presented sets.

For the following images you see, choose which fitness facility you would prefer to work out in. *

Option 1



Option 2



This is an example of one of the questions in our survey where we tested on different lighting features: option one has a more yellow lighting and option two has brighter whiter lighting. For this question we had 80.6% of our respondents prefer option two over option 1.

For the following images you see, choose which fitness facility you would prefer to work out in.

Option 1



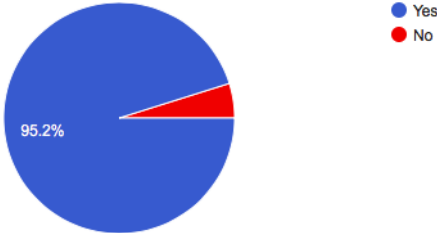
Option 2



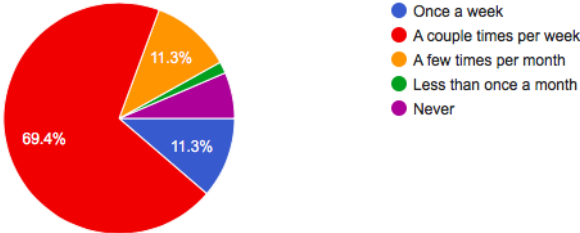
This is a photo of one of our control images: participant choices were distributed as 48.4% for option one and 51.6% for option two.

The Following are images of our results from google forms:

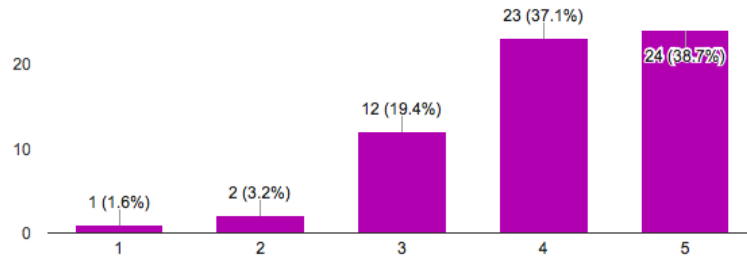
Do you exercise? (62 responses)



If you answered yes, how often do you exercise? (62 responses)

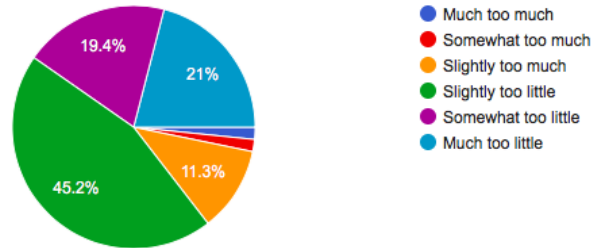


How Important Is Exercise to You? (62 responses)



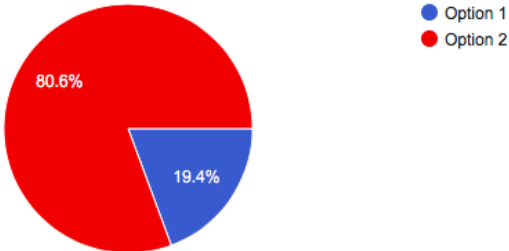
Do you feel that you get: too much exercise, too little exercise, or about the right amount?

(62 responses)



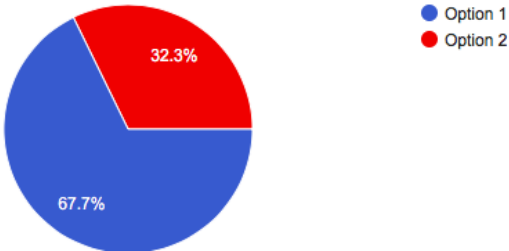
For the following images you see, choose which fitness facility you would prefer to work out in.

(62 responses)



For the following images you see, choose which fitness facility you would prefer to work out in.

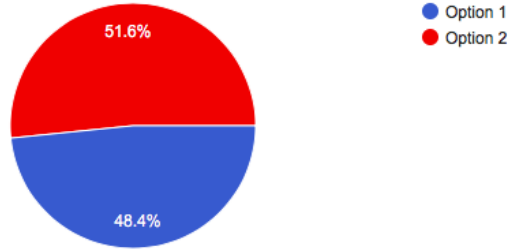
(62 responses)



These are the results for questions 1 and 2 from google forms

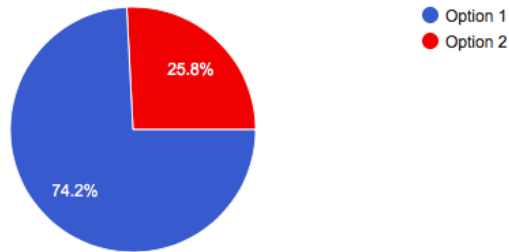
For the following images you see, choose which fitness facility you would prefer to work out in.

(62 responses)



For the following images you see, choose which fitness facility you would prefer to work out in.

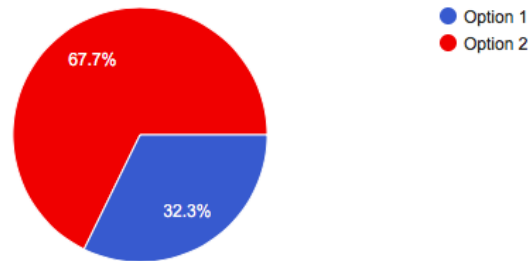
(62 responses)



These are the results from questions 3 and 4 from google forms.

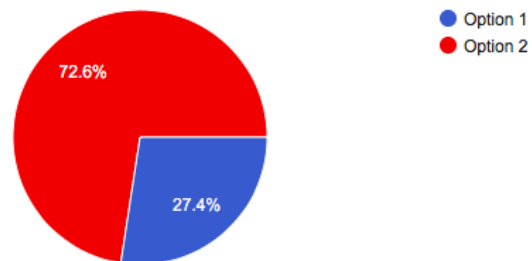
For the following images you see, choose which fitness facility you would prefer to work out in.

(62 responses)



For the following images you see, choose which fitness facility you would prefer to work out in.

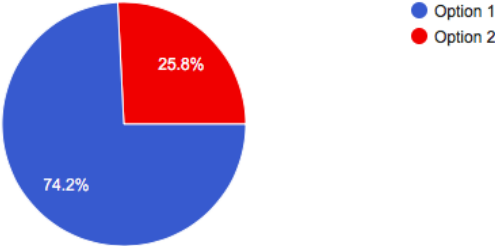
(62 responses)



These are the results from questions 5 and 6 from google forms.

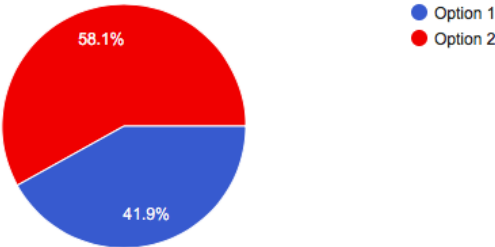
For the following images you see, choose which fitness facility you would prefer to work out in.

(62 responses)



For the following images you see, choose which fitness facility you would prefer to work out in.

(62 responses)



These are the results from questions 7 and 8 from google forms.