



How does wearing a FitBit effect physical activity levels in subjects?

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Abstract

In this study the researchers gave 10 participants a FitBit each and they were told to record their activity levels in a logbook for six weeks while wearing the FitBit and the same again but without the FitBit to see whether the FitBits had an influence on activity levels in these participants. The researchers then gave the participants a consent form with a right to withdraw at any point from the study without their data being used. The participants then filled in a health screening questionnaire to see if the researchers needed to provide any advice on what exercises to avoid for a certain injury or illness. After all the data was collected it was analysed by doing the T-Test on the data to see if activity has increased over the six weeks in general and also to see if the novelty of a FitBit wore off over the first week compared to the sixth week. The results showed that the FitBits did increase activity levels in those who wear them compared to when they didn't wear a FitBit and also the novelty of wearing a FitBit did wear off over the six weeks as less calories were burnt in the sixth week compared to the first week with a FitBit.

Appendices

	A	B	C	D	E	F	G
1	Client	Week 1 (FitBit)	Week 6 (FitBit)	Average Over 6 Weeks (FitBit)			Average Over 6 Weeks (No FitBit)
2	AH	4,920	4,920	4,920			3,840
3							
4							
5	JF	3,638	3,174	3,174			3,997
6	KP	9,060	6,240	7,528			4,530
7	LD	6,175	5,072	5,792			3,252
8	LP	12,493	10,500	10,956			10,956
9	MG	8,060	6,895	7,528			6,160
10							
11	RM	7,434	7,434	7,434			2315
12	RW	2386	1648	1731			1025

Appendix 1

1	A	B	C	D	E	F	G	H	I	J	K	L	M
2	Activity Logbook												
3	Week 1												
4	Day	Walking	Running	Cycling	Swimming	Gym	Sport Name	Sport Name	Sport Name	Other	How many steps do you think you have burnt?	How many Calories do you think you have burnt?	
5	<i>Example</i>	60 minutes	30 minutes	0 minutes	0 minutes	30 minutes	Football 60 minutes			0 minutes	11,200	800	0
6	Monday	30 minutes									0	0	0
7	Tuesday	30 minutes				0 30 minutes					0	0	0
8	Wednesday	30 minutes									0	0	0
9	Thursday	30 minutes	30 minutes								0	0	0
10	Friday	30 minutes				0 30 minutes					0	0	0
11	Saturday		0	0	0	0					0	0	0
12	Sunday		0	0	0	0					0	0	0
13	Week 2												
14	Day	Walking	Running	Cycling	Swimming	Gym	Sport Name	Sport Name	Sport Name	Other	How many steps do you think you have burnt?	How many Calories do you think you have burnt?	
15	Monday	30 minutes									0	0	0
16	Tuesday	30 minutes	30 minutes			0 30 minutes					0	0	0
17	Wednesday	30 minutes									0	0	0
18	Thursday	30 minutes									0	0	0
19	Friday	30 minutes	30 minutes			0 30 minutes					0	0	0
20	Saturday		0	0	0	0					0	0	0
21	Sunday		0	0	0	0					0	0	0
22	Week 3												
23	Day	Walking	Running	Cycling	Swimming	Gym	Sport Name	Sport Name	Sport Name	Other	How many steps do you think you have burnt?	How many Calories do you think you have burnt?	
24	Monday	30 minutes									0	0	0
25	Tuesday	30 minutes	30 minutes			0 30 minutes					0	0	0
26	Wednesday	30 minutes				0 30 minutes					0	0	0
27	Thursday	30 minutes									0	0	0
28	Friday	30 minutes	30 minutes			0 30 minutes					0	0	0
29	Saturday		0	0	0	0 30 minutes					0	0	0
30	Sunday		0	0	0	0					0	0	0
31	Week 4												
32	Day	Walking	Running	Cycling	Swimming	Gym	Sport Name	Sport Name	Sport Name	Other	How many steps do you think you have burnt?	How many Calories do you think you have burnt?	
33	Monday	30 minutes									0	0	0
34	Tuesday	30 minutes	30 minutes			0 30 minutes					0	0	0
35	Wednesday	30 minutes									0	0	0
36	Thursday	30 minutes									0	0	0
37	Friday	30 minutes	30 minutes			0 30 minutes					0	0	0
38	Saturday		0	0	0	0					0	0	0
39	Sunday		0	0	0	0					0	0	0
40	Week 5												
41	Day	Walking	Running	Cycling	Swimming	Gym	Sport Name	Sport Name	Sport Name	Other	How many steps do you think you have burnt?	How many Calories do you think you have burnt?	
42	Monday	30 minutes									0	0	0
43	Tuesday	30 minutes	30 minutes			0 30 minutes					0	0	0
44	Wednesday	30 minutes									0	0	0
45	Thursday	30 minutes									0	0	0
46	Friday	30 minutes	30 minutes			0 30 minutes					0	0	0
47	Saturday		0	0	0	0					0	0	0
48	Sunday		0	0	0	0					0	0	0
49	Week 6												
50	Day	Walking	Running	Cycling	Swimming	Gym	Sport Name	Sport Name	Sport Name	Other	How many steps do you think you have burnt?	How many Calories do you think you have burnt?	
51	Monday	30 minutes									0	0	0
52	Tuesday	30 minutes				0 30 minutes					0	0	0
53	Wednesday	30 minutes	30 minutes								0	0	0
54	Thursday	30 minutes									0	0	0
55	Friday	30 minutes				0 30 minutes					0	0	0
56	Saturday		0	0	0	0					0	0	0
57	Sunday		0	0	0	0					0	0	0

Appendix 2

H	I	J	K	L
Participant	Average calories burnt per week (FitBit)	Average calories burnt per week (No FitBit)	Difference	(Difference - Mean difference) Squared*
AH	4920	3840	1080	295392.25
JF	3174	3997	-823	5985362.25
KP	7528	4530	2998	1889250.25
LD	5792	3252	2540	683102.25
LP	10956	10956	0	2635752.25
MG	7528	6160	1368	65280.25
RM	7434	2315	5119	12218520.25
RW	1731	1025	706	841806.25
Mean:			1623.5	SD: 24614196/7 = 3516313.714 *Square Root* = 1875.184
				T = 1623.5 x *Square Root (8)/1875.184 = 2.45

Appendix 3

	A	B	C	D	E
1	Participant	Week 1 (FitBit)	Week 6 (FitBit)	Difference	(Difference - Mean Difference) Squared*
2	AH	4920	4920	0	845,296.36
3	JF	3638	3174	464	207,389.16
4	KP	9060	6240	2820	3,612,280.36
5	LD	6175	5072	1103	33,708.96
6	LP	12493	10500	1993	1,152,616.96
7	MG	8060	6895	1165	60,319.36
8	RM	7434	7434	0	845,296.36
9	RW	2386	1648	738	32,905.96
10	Mean:			919.4	SD: 6,789.813.48/7 = 969.973.35 "square root" = 984.87
11					
12					T = 919.4 x "square root (8)" / 984.87 = 2.64

Appendix 4

Chapter 1 - Introduction

In this project the researchers were testing whether wearing a FitBit device would increase physical activity levels in those that wore it for a 6 week period. To measure physical activity levels the participants were asked to fill out a data sheet every day for 6 weeks on what kind of exercise they had done that day and for how long they did that activity for. From this the researchers worked out how many calories each individual burnt. From this the researchers discovered that a FitBit does increase activity levels overall as more calories were burnt over the 6 weeks. The researchers chose FitBits as “they’re becoming increasingly popular as measuring tools for physical activity.” - *J. Sirard, 2001*.

The reasons this study is so important is because the impact the results will have on schools, performers and coaches is very significant. If a FitBit does increase activity levels, then schools are more likely to spend money on providing them to children for extended periods at a time. This may lead to a decrease in childhood obesity and just unhealthy children in the future. Performers will also have a significant interest in the results of this study as if activity levels increase while wearing a FitBit then they are more likely to use them to improve their performance levels and just being more active in general. Finally, coaches can use this data to use FitBits to monitor their players physical activity both on and off the pitch.

Chapter 2 - Literature Review

2.1 - Independent Variables

The independent variables in this project are that all the participants are going to be that all participants are going to do some sort of exercise over the 6 weeks whether they are wearing a FitBit or not, this will not change, this makes it an independent variable as nothing will effect the fact exercise will be done, even in very small amounts. Another independent variable is that everyone gets the same model of FitBit so the results they gained were reliable. This again is an independent variable because no other factors can influence the type of model the FitBit is and that everyone has the same model.

2.2 - Dependant Variables

There is only one dependant variable in this study as the study isn't specific in what participants do as exercise and whether they are wearing a FitBit or not. So the more calories they burn the more exercise they have done while wearing a FitBit. When the participants are not wearing the FitBit, less activity was completed so the independent variable had less of an effect.

2.3 - Research Questions

2.3.1 - What do FitBit devices do?

“When it comes to motivating people to work out, Richard Simmons has nothing on FitBit. FitBit is a physical activity tracker designed to help you become more active, eat a more well-rounded diet, sleep better and ultimately, turn you into a healthier human being. And it

does it all without subjecting you to a weird afro or a maniacal grin.

The FitBit was introduced in 2008 by co-founders Eric Friedman and James Park in San Francisco. In short, it's a 21st-century pedometer.” - *N. Chandler, 2017*

2.3.2 - Why do people use a FitBit?

“As far as me or other millions of users who are using Fitbit actively thinks it is extremely useful for number of reasons. Most of the reasons are interconnected.

I stay motivated to walk/jog/run more often than normal.

Gives better flexibility to my body by keeping me active.

Tracks my sleep and reminds me to sleep more than my usual 4 or 5 hours.

Challenge and compete my friends so I do more than my normal active run.

Gives me incentives like badges so I know what I have achieved.

I avoid taking elevator for 4 or 5 floors and take stairs. Fitbit tracks floors too.

Provides Heart rate. When I run for 30 mins I need to slow down.

Daily challenges, Hourly step counts tell me not to sit at my desk all the time.

It is not perfect but close to it.

It has alarm too. My hand knows before my ear that I need to get up.” - *R, Chirala,*

2016

2.3.3 - How effective are FitBits in increasing activity levels?

“Overall the participants without fitness trackers lost 13 pounds, while the tech-enhanced group lost 7.7 pounds. They ranged in age from 18 to 35 years and had

BMI's from 25 to 39. The study hopes to see whether helping young adults lose weight early on can head off more weight gain in middle age.” - *E, Ross, 2016*

Chapter 3 - Methodology

3.1 - Research Design

In this study the researchers used quantitative data as all the results collected were in a numerical form. This is due to the results being recorded in number of steps taken, number of calories burnt and how many minutes walking, running and sports recorded in the six week periods.

Also, in this study, the researchers did their own research and did not rely on secondary data to back up their results. This means the researchers used primary research in their results and data collected. For example, the FitBits recorded the data on each participant so this is primary data for the researchers.

Furthermore, the researchers in this study used an experimental approach as they manipulated a variable to have an affect on another variable. This is used in this study where the researchers manipulated whether the participants were wearing a FitBit or not and in turn this made the amount of calories burnt differ significantly.

Finally, the researchers used repeated measures in their study. This was because they did not have enough participants to run two 6 week logbooks at the same time so they had to use the same 10 participants for the FitBit and non-FitBit tests. So both tests were done with the same set of participants making the researchers study a repeated measures study. The participants used this because they could not find enough participants willing to take part in this study.

3.2 - Participants and Sampling Design

In this study the researchers used 10 participants for both FitBit and non-FitBit tests, this consisted of a mix of both males and females but the researchers do not know the exact number due to confidentiality reasons. The participants fitness levels are unknown as the researchers did not directly engage with the participants during the study as they were just given FitBits and told to record their activity levels in a logbook for both tests. The researchers conducted a questionnaire in which medical conditions were stated and there was only one participant that had a significant medical condition that could affect the amount of exercise they do. This medical condition is called Hypermobility. Hypermobility is a condition that affects the joints in the body, mainly the hips, knees, shoulders and ankles, and it means that these joints can move more than a regular joint, which makes them more likely to dislocate during exercise or strain in those specific areas. This is why it can affect this person's results as they may find it difficult to exercise as often as it may do more damage than good. All these participants are from the North West of England.

3.3 - Methods Used To Collect Data

In this study the researchers used questionnaires to gain some data like medical conditions, diet and current exercise levels. This study was a field experiment, this is because the only Independent Variable that has been applied is whether the participants are wearing the FitBits or not so any exercise they do or don't do is totally unpredictable and natural as it's their choice what they do or don't do so the researchers don't manipulate anything else in the study. The researchers also used logbooks for every participant in the study for when they were wearing the FitBit and non-FitBit tests. They had to fill in the number of minutes activity they did and what kind of activities they were taking part in.

3.4 - Methods Of Analysis

In this study the researchers used the paired T-test to analyse their results. This is because the study used a repeated pairs design and also interval data was collected. This means the paired T-test is most appropriate for this study. To calculate this test you first need to work out the standard deviation of the set of data. You can do this by finding the difference in calories between participants in both conditions, after this take the mean difference from the difference. Then by adding up all these for each participant it will give you standard deviation. From this you need to square root this number and this should give you your T-test value. With this number you can see the significance of your result you must use the degrees of freedom table and with a one tailed test at 0.05 with 10 participants. For the researchers results to be significant they the t value must be the same or higher than the value on the relevant section on the degrees of freedom table.

3.5 - Reliability and Validity

Validity is where the researchers ensure that the results were considered valid results. This was done by controlling extraneous variables that could have affected the results in both a negative and positive way. One variable is that is controlled by the researchers is instrumentation. This is to ensure that all the FitBits used in this study are fully calibrated and work correctly without any glitches or malfunctions. Other variables the researchers has to consider is time. This was to ensure that all participants did the study of one condition for a full six weeks and only six weeks, before changing the conditions for those participants. This was to ensure all participants had an equal amount of time to get as much physical activity recorded as they thought necessary, this increases the internal validity of this study. However, despite the researchers controlling extraneous variables there were still confounding variables

that could have had an effect on the results and internal validity of this study. An example of this may be weather. If the weather is poor then the participants are less likely to go outside and exercise as they may get ill or it will make them not feel good if it's raining and windy for example. Furthermore, the participants are all from the same area of the UK which makes the external validity of this study less valid as it cannot be generalized with the rest of the country. This also applies for the fact all the participants are of a similar age group which also reduces the external validity of this study as again, it cannot be generalised to the rest of the population. Reliability is whether the results of a study are consistent and accurate. To maintain reliability in this study the researchers must take into account the fact that the participants may experience exhaustion as they will need to reduce activity levels to rest and recover, especially towards the end of the day. To prevent this the researchers have instructed the participants to a set of cool downs. This will help them as it remove any lactic acid that has built up during exercise, this will help participants from becoming overly fatigued throughout the study. Furthermore, the participants should get at least 8 hours of sleep per night to allow their bodies to recover in the first 7 hours and to allow the brain to recover in the final hour of sleep.

3.6 - Ethical Considerations

Before this study took place, all the participants involved in this study were provided with a consent form in which they all signed. The consent form outlined to the participants what the study was about and what they would be involved in throughout the study. Furthermore, the researchers sent a health questionnaire to all the participants to make sure all participants

were safe and healthy enough to complete this study. The researchers could also attribute anomalies in the results to a short term or long term injuries or illnesses a participant may have - this may help as the researchers can recommend exercises to avoid and to keep them safe and injury free. The participants were also informed that they have a right to withdraw at anytime before, during or after the study. If a participant would like to withdraw then their data will be erased and not used in the outcome of the study. Finally, the identity of the participants was kept anonymous as they're only referred to as initials.

Chapter 4 - Results

4.1 - Raw Data

	A	B	C	D	E	F	G
1	Client	Week 1 (FitBit)	Week 6 (FitBit)	Average Over 6 Weeks (FitBit)			Average Over 6 Weeks (No FitBit)
2	AH	4,920	4,920	4,920			3,840
3							
4							
5	JF	3,638	3,174	3,174			3,997
6	KP	9,060	6,240	7,528			4,530
7	LD	6,175	5,072	5,792			3,252
8	LP	12,493	10,500	10,956			10,956
9	MG	8,060	6,895	7,528			6,160
10							
11	RM	7,434	7,434	7,434			2315
12	RW	2386	1648	1731			1025

1	A	B	C	D	E	F	G	H	I	J	K	L	M
2	Activity Length												
3	Week 1												
4	Day	Walking	Running	Cycling	Swimming	Gym	Sport Name	Sport Name	Sport Name	Other	How many steps do	How many Calories do you think you have burnt?	
5	Monday	30 minutes	0	0	0	0	Football 60 minutes			0 minutes	11,260	0	
6	Tuesday	30 minutes	0	0	0	0				0	0	0	
7	Wednesday	30 minutes	0	0	0	0				0	0	0	
8	Thursday	30 minutes	0	0	0	0				0	0	0	
9	Friday	30 minutes	0	0	0	0				0	0	0	
10	Saturday	0	0	0	0	0				0	0	0	
11	Sunday	0	0	0	0	0				0	0	0	
12	Week 2												
13	Day	Walking	Running	Cycling	Swimming	Gym	Sport Name	Sport Name	Sport Name	Other	How many steps do	How many Calories do you think you have burnt?	
14	Monday	30 minutes	0	0	0	0				0	0	0	
15	Tuesday	30 minutes	0	0	0	0				0	0	0	
16	Wednesday	30 minutes	0	0	0	0				0	0	0	
17	Thursday	30 minutes	0	0	0	0				0	0	0	
18	Friday	30 minutes	0	0	0	0				0	0	0	
19	Saturday	0	0	0	0	0				0	0	0	
20	Sunday	0	0	0	0	0				0	0	0	
21	Week 3												
22	Day	Walking	Running	Cycling	Swimming	Gym	Sport Name	Sport Name	Sport Name	Other	How many steps do	How many Calories do you think you have burnt?	
23	Monday	30 minutes	0	0	0	0				0	0	0	
24	Tuesday	30 minutes	0	0	0	0				0	0	0	
25	Wednesday	30 minutes	0	0	0	0				0	0	0	
26	Thursday	30 minutes	0	0	0	0				0	0	0	
27	Friday	30 minutes	0	0	0	0				0	0	0	
28	Saturday	0	0	0	0	0				0	0	0	
29	Sunday	0	0	0	0	0				0	0	0	
30	Week 4												
31	Day	Walking	Running	Cycling	Swimming	Gym	Sport Name	Sport Name	Sport Name	Other	How many steps do	How many Calories do you think you have burnt?	
32	Monday	30 minutes	0	0	0	0				0	0	0	
33	Tuesday	30 minutes	0	0	0	0				0	0	0	
34	Wednesday	30 minutes	0	0	0	0				0	0	0	
35	Thursday	30 minutes	0	0	0	0				0	0	0	
36	Friday	30 minutes	0	0	0	0				0	0	0	
37	Saturday	0	0	0	0	0				0	0	0	
38	Sunday	0	0	0	0	0				0	0	0	
39	Week 5												
40	Day	Walking	Running	Cycling	Swimming	Gym	Sport Name	Sport Name	Sport Name	Other	How many steps do	How many Calories do you think you have burnt?	
41	Monday	30 minutes	0	0	0	0				0	0	0	
42	Tuesday	30 minutes	0	0	0	0				0	0	0	
43	Wednesday	30 minutes	0	0	0	0				0	0	0	
44	Thursday	30 minutes	0	0	0	0				0	0	0	
45	Friday	30 minutes	0	0	0	0				0	0	0	
46	Saturday	0	0	0	0	0				0	0	0	
47	Sunday	0	0	0	0	0				0	0	0	
48	Week 6												
49	Day	Walking	Running	Cycling	Swimming	Gym	Sport Name	Sport Name	Sport Name	Other	How many steps do	How many Calories do you think you have burnt?	
50	Monday	30 minutes	0	0	0	0				0	0	0	
51	Tuesday	30 minutes	0	0	0	0				0	0	0	
52	Wednesday	30 minutes	0	0	0	0				0	0	0	
53	Thursday	30 minutes	0	0	0	0				0	0	0	
54	Friday	30 minutes	0	0	0	0				0	0	0	
55	Saturday	0	0	0	0	0				0	0	0	
56	Sunday	0	0	0	0	0				0	0	0	

4.2 - Data Analysis

The raw data in 4.1 is what the researchers collected as data to be analysed. From this data you can see that when using a FitBit physical activity increased generally as more calories were burnt by each participant. This proves the researcher's hypothesis correct as the amount of a physical activity recorded with a FitBit over six weeks is higher than the amount of physical activity recorded without the FitBit over a six week period. This links to the hypothesis as physical activity has increased due to the influence of the FitBit devices being around the participant's wrists.

H	I	J	K	L
Participant	Average calories burnt per week (FitBit)	Average calories burnt per week (No FitBit)	Difference	(Difference - Mean difference) Squared*
AH	4920	3840	1080	295392.25
JF	3174	3997	-823	5985362.25
KP	7528	4530	2998	1889250.25
LD	5792	3252	2540	683102.25
LP	10956	10956	0	2635752.25
MG	7528	6160	1368	65280.25
RM	7434	2315	5119	12218520.25
RW	1731	1025	706	841806.25
Mean:			1623.5	SD: 24614196/7 = 3516313.714 *Square Root* = 1875.184
				T = 1623.5 x *Square Root (8)*/1875.184 = 2.45

	A	B	C	D	E
1	Participant	Week 1 (FitBit)	Week 6 (FitBit)	Difference	(Difference - Mean Difference) Squared*
2	AH	4920	4920	0	845,296.36
3	JF	3638	3174	464	207,389.16
4	KP	9060	6240	2820	3,612,280.36
5	LD	6175	5072	1103	33,708.96
6	LP	12493	10500	1993	1,152,616.96
7	MG	8060	6895	1165	60,319.36
8	RM	7434	7434	0	845,296.36
9	RW	2386	1648	738	32,905.96
10	Mean:			919.4	SD: 6,789,813.48/7 = 969,973.35 *square root* = 984.87
11					
12					T = 919.4 x *square root (8)*/984.87 = 2.64

Chapter 5 - Discussions & Conclusions

To conclude the analysis of the data, the researchers have found that FitBits do in fact increase activity levels over six weeks which can also be seen in 4.1 in the pictures of raw data. Also, the researchers have seen how the novelty of wearing a FitBit also decreases from week one to week six while wearing one as calories burnt gradually decreased week by week compared to week one. This can also be seen in. 4.1 of raw data as the table is all the data collected over the two conditions and total of 12 weeks worth of data to analyse.

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Chapter 6 - Strengths & Weaknesses

6.1 - Strengths (P5, M3)

One strength is that the researchers got the participants to use the FitBits for the period of six weeks which allows the participants to give enough data to make the study more internally valid. This is a significant amount of time and it will allow the researchers to get a lot of data from the 10 participants for both the FitBit and non-FitBit conditions of the study. This makes the researchers study more reliable and valid due to a higher volume of data collected over a total of 12 weeks from 10 participants. Another strength of this study is that it was a natural experiment as the researchers did not tell the participants to do a certain amount of exercise or what exercises to do, so it was up to the participants how much exercise they did while they were wearing the FitBit and while they were not wearing the FitBit. This increases the external validity of the study as it can be applied to other people in the area and the country.

6.2 - Weaknesses (P5, M3)

One weakness is that the participants were only based in the North West of England and of a similar age group which means it has limited the level in which the results can be linked to other people in the country. Because of this the researcher's study has a reduction in external validity for this study. To improve this I would recommend that the researchers use participants from all over the country, from all walks of life. Another weakness of this study is that the researchers only used 10 participants in the whole study for both conditions of wearing a FitBit and not wearing a FitBit for six weeks at a time. To improve this I would recommend that the researchers use at least 50 participants as this will create a higher volume

of data to analyse for the researchers.

6.3 - Justification (D2)

The first justification is that the researchers should use participants outside the North West of England and of similar ages, 16-18. This is because it will allow the data to be more valid and used against the rest of the country as the study will increase in external validity making the whole study more reliable and valid to use with other studies in the future. Furthermore, the other justification is that the researchers should use at least 50 participants in this study. This is because it will allow the researchers to have a higher volume of data to analyse and this will make anomalies have less of an impact on the results of the study and this will also make the results more accurate and reliable due to the increase in valid data recorded, this makes the study as a whole more reliable and valid to use in other studies both internally and externally.