How physical activity and obesity is related to the innovativeness of an individual

Author: Sietse Weekenstroo
University of Twente
P.O. Box 217, 7500AE Enschede
The Netherlands

ABSTRACT, This bachelor's thesis assesses whether or not innovativeness of an individual can be predicted by modifiable lifestyle-related health risk factors. The health risk factors in this study are physical activity and obesity. Previous studies indicate that these health risk factors have an influence on work performance. Higher scores of physical activity was found to have a positive effect on overall work performance and obesity had a negative effect on work loss days. This study tested these health risk factors against innovativeness by using correlation and regression analysis to see whether or not a significant relation exists. The data for this thesis was collected by sending out a questionnaire to individuals older than 30 years and with a higher education, 99 responses were collected. No evidence was found that physical activity or obesity had a significant relationship with innovativeness.

Supervisors: Dr. M. de Visser & Dr.ir. S.J.A. Löwik

Keywords
Innovation; modifiable health risks; obesity; physical activity; exploration; exploitation

5th IBA Bachelor Thesis Conference, July 2nd, 2015, Enschede, The Netherlands.

1. INTRODUCTION

In the last couple of decades innovation has become more important in corporations and the ability and willingness to innovate can be seen as a central role in the survival of an organization (Ancona & Caldwell, 1987). Consumers and organizations both wish to have new products and features. The demand for innovation has become so vital to the success of an organization that innovation can be seen as an organization's main source for success (Tushman & O'Reilly, 1996).

There has been done much research on innovation as it's such an important part of businesses. On finding out the pre-determinants of innovation there has been done research before, however, most research focuses on organizational and group level of analysis. For example, Damanpour (1990) studied organizational pre-determinants of innovation such as *organization types*. Another organizational pre-determinant of innovation is *organizational culture*; studies showed that the organization's culture provides its members with a perspective on organizational goals, mission and dominant logic that guides exploratory and exploitative innovative activities (Miles & Snow, 1978; Tripsas, 2009). Other organizational pre-determinants include factors as *organizational age* (Sorensen & Stuart, 2000; Rothaermel & Deeds, 2004), *organizational size* (Rothaermel & Deeds, 2004; Beckman et al. 2004) and an organization's *absorptive capacity* (Cohen & Levinthal, 1990; Lavie & Rosenkopf, 2006; Rothaermel & Alexandre, 2009) as well as other factors.

On team-level of analysis, pre-determinants of innovation have also been found. For example *team size* was found to be beneficial for the completion of difficult tasks in uncertain complex environments; it is proposed that team size is positively related to innovation (Stewart, 2006). Another pre-determinant of innovation on the team-level of analysis is *team longevity*, it has been asserted that teams become less innovative over time as they become more susceptible to groupthink, more homogeneous and less inclined to be critical and challenge the status quo (Anderson & West, 1998). Other factors on a team-level of analysis include *task orientation* (West, The social psychology of innovation in groups, 1990), *team cohesion* (West & Farr, 1989; Woodman et al., 1999) as well as other factors.

This study focuses on finding new pre-determinants of innovation of individual characteristics. Similar studies have been performed in the past but there is still a lot of ground not yet covered. A comprehensive theoretical framework of this part of innovation exists (Balau, Faems, & Van der Bij, 2012) which provides an overview of various individual characteristics of innovation. This study focuses on the personality of individuals, as well as their motivation, cognitive skills and demographics. There's found evidence for various pre-determinants of innovation of individual characteristics, but a gap exists in the literature. In this gap new pre-determinants of innovation could be found.

The individual pre-determinants already tested focus on different aspects of individuality. Causal relationships have been found in areas such as personality (Zhou & George, 2001; Zibarras, Port & Woods, 2008) and demographic factors such as age (West, A measure of role innovation at work, 1987)and tenure (Papadakis & Bourantas, 1998).

Possible effects of physical characteristics on innovative behavior have not yet been tested. Though, work has been done on identifying effect of individual physical characteristics on general work performance. There has been previous research on the effect of lifestyle-related modifiable health risks on work performance (Pronk, Martinson, Kessler, Beck, Simon, & Philip Wang, 2004). Results of this study indicated that higher levels of physical activity and a higher cardiorespiratory fitness level were related to reduced decrements of work performed and showed a positive impact on work performance. Contrary, obesity showed to have a negative impact on sick days taken and an overall negative impact on work performance.

The results of the study performed by Pronk et al. (2004) leads us to believe that lifestyle-related modifiable health risks could also have an impact on an individual's innovative behavior and could be a pre-determinant for innovation. We expect to see an effect because if these factors can influence general work performance, then different effects may also be possible which have not yet been tested. It's relevant to address the gap as the practical implications could mean that, should the modifiable health risks have an impact on individual innovativeness, organizations would have further incentive to strife for a healthy and fit workforce. Also, the study could contribute to existing theories of pre-determinants of innovation and the effects of modifiable health risks.

Therefore, the research question of this Bachelor thesis is: *Can individual innovative behavior be explained by lifestyle-related modifiable health risks?* To answer this research question, information has to be collected about the literature and the proper methodology.

2. THEORY

In order to understand what is meant by the theoretic concepts of "innovation" and "lifestyle-related modifiable health risks", they both will be described with relevant literature. The theoretic concept of "lifestyle-related modifiable health risks" will be described mainly by using the paper of Pronk et al. (2004). First the concept of "innovation" is described.

2.1 Innovation

Before we set out to find new pre-determinants of individual innovative behavior, we must first define innovation. Innovation is a concept that finds its roots in scientific publications all the way back in the 1930's. Here, in his seminal work, economist Joseph A. Schumpeter describes innovation as: "The creation and implementation of 'new combinations' related to new products, services, work processes or markets" (Schumpeter, The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest and the Business Cycle, 1934). Schumpeter later labeled this process as "creative destruction" (Schumpeter, Capitalism, Socialism and Democracy, 1942). The main element in this definition seems to be novelty. Later on, other researches also stress the importance of novelty.

Nowadays the definition of innovation is a very diverse one. In a multitude of studies innovation is discussed and various slightly different definitions are used. Using a synthesis of these studies, most often innovation is defined as or has the meaning of a successful commercialization or bringing into common use of an invention (Conway & Steward, 2009).

Researchers have found empirical evidence in their studies that innovation is a main source for firms to have a competitive advantage over their competitors. Firms aspire to innovate in order to have a competitive advantage so they can improve their firm performance (Porter, 1990). Other motivators for innovation were found as Katila and Ahuja (2002) found that innovations are essential for firms to keep up with technical developments and changing market conditions. Furthermore, it was found to be essential for a firm's growth and survival (Gnyawali & Srivastava, 2013). Other possible reasons for firms to innovate are doing things in a more efficient or effective matter, finding a better way to fulfill the needs of

customers. Ultimately, it can be argued that the main reason for innovation is the survival of a firm.

This study focuses on the individual level of analysis of innovation. Most literature on innovation focuses on the team-level and organizational level of analysis. Different individual pre-determinants of innovation are discussed later.

2.1.1 Explorative and exploitative innovation

Most studies about innovation distinguish between two different types of innovation, exploitative innovation and exploratory innovation. (March, 1991) describes exploration and innovation as two radically different types of learning. March highlights the need of a firm to have both explorative and exploitative innovation within a firm in order to have a good foundation for long-term survival. Exploration is defined as "a pursuit of new knowledge" and exploitation is defined as "the use and development of things already known (Levinthal & March, 1993). Table 1, adapted from (Jansen, 2005) provides a summary of the different characteristics of exploitation and exploration.

Table 1: Exploratory and exploitative innovations

	Exploratory innovation	Exploitative innovation
Definition	Are radical innovations and are designed to meet the needs of emerging customers or markets	Are incremental innovations and are designed to meet the needs of existing customers or markets
Outcomes	New designs, new markets and new distribution channels	Existing designs, current markets and existing distribution channels
Knowledge base	Require new knowledge and departure from existing knowledge	Build and broaden existing knowledge and skills
Results from	Search, variation, flexibility, experimentation, and risk-taking	Refinement, production efficiency and execution
Performance implications	Distant in time	Short-term benefits

In this study, quantitative research will be conducted to find new pre-determinants of innovation, in which innovation is operationalized as a concept which includes factors from exploitation and exploration. It may occur that some pre-determinants can explain certain explorative innovation, but not exploitative innovation and vice versa, therefore both concepts are used to have a thorough and well-defined concept of innovation. Few studies have quantitatively examined relationships between individual characteristics and explorative and exploitative behavior. Exceptions are Mom, Van den Bosch, & Volberda (2009) and De Visser (2013). Mom et al. shows differences between explorative and exploitative behavior in managers, which are influenced by different coordination mechanics. De Visser (2013) complements this research by focusing not on extrinsic motivational factors, but on cognitive factors. De Visser (2013) also elaborates on the implication of individual exploration and exploitation for firm performance. With this study we use the same, slightly modified, model for exploration and exploitation. We complement this prior research by not focusing on extrinsic motivational factors or cognitive factors, but on physical fitness factors, which are elaborated later. Another distinction in this study is that it doesn't focus on exploitative and explorative behavior in managers, but employees from different levels in a firm.

2.1.2 Individual pre-determinants of innovation

This importance of innovation has left firms with a large desire to be as innovative as possible. After all, a highly innovative firm has a better chance of future success than a firm with no special regard for innovation. Therefore, many studies have been conducted on the pre-determinants of innovation. What exactly makes a person, group or firm more innovative than others? An answer to this question would be of great value to a firm.

In this study the aim is to find a new pre-determinant of innovation on an individual. Though, many pre-determinants of innovation have already been found at different levels of an organization. In this part a small overview of those pre-determinants will be provided, as it was studied by Balau et al. (2012). This overview will provide an understanding of the pre-determinants already studied and a better understanding of this studies' place in the existing literature.

Most of the studies conducted on pre-determinants of innovation have focused on organizational and group level of analysis. Even though individuals are cited as a critical component of innovative success, only a small number of studies have covered the individual perspective of innovative performance.

Balau et al. provides an overview of these characteristics that influence innovation on an individual, team and firm level as studied in earlier research. They also distinguish different types of innovation. The characteristics that influence innovation on an individual level are classified as follows: *personality*, *motivation*, *cognitive*, *affective* and *demographics*. For the relevance of this study a small summary of individual characteristics will be shown.

On personality, some of the characteristics shown to have impact on individual innovativeness were: *openness*, *consciousness*, *pro-activeness* and *neuroticism*. On motivation a couple of characteristics were also shown to have an impact upon individual innovativeness. It was found that both *intrinsic* and *extrinsic* motivators are pre-determinants of innovation at an individual level. For cognitive factors a large amount of studies were shown to have an impact on individual innovativeness. Among them are: *intuitive problem solving style*, *creativeness* and *self-leadership skills*. Affective factors found were characteristics such as *work engagement* and *employee commitment*. Finally, demographic variables that were proven to have an effect on individual innovativeness are factors such as *age*, *tenure* and *education*. For instance, age had a positive significant relationship with role innovation (West, A measure of role innovation at work, 1987).

As shown, many pre-determinants have already been proven. Yet, little to no studies has been performed on the physical fitness of individuals and the implication on innovation. This study aims to fill that gap.

2.2 Lifestyle-related modifiable health risk factors

Literature explains that modifiable health risks have a significant relation on morbidity and on health-care costs (Pronk, Tan, & O'Connor, Obesity, Fitness, and health care costs, 1999). Pronk et al. (2004) defines how modifiable health risks have an influence on work performance. The modifiable health risks tested are physical activity, cardiorespiratory fitness and obesity. Dependent variables in Pronk et al. are number of work loss days, quantity and quality of work performed, overall job performance, extra effort exerted, and interpersonal relationships. To test these modifiable health risks a quantitative approach was used. A questionnaire was made with nearly 700 respondents. The results were clear: higher levels of physical activity were related to reduced decrements in quality of work performed and overall performance. Higher cardiorespiratory fitness was related to decreased decrements in quantity of work performed and reduction in extra effort exerted to perform the work. Obesity related to more difficulty in getting along with coworkers. Severe obesity related to a higher number of work loss days. The overall conclusion made is that lifestyle-related modifiable health risk factors significantly impact employee work performance.

Relying on these different brands of literature we conclude that influence from modifiable health risk factors exists on individual work performance levels. This implies that influence may also occur in other aspects of work-related factors. We expect that modifiable health risk factors can have an impact on their exploitative and explorative innovative behavior.

For obesity the connection with work performance are mostly negative effects. To construct our own hypothesis in line with this knowledge we come up with the following hypothesis:

H1: Obesity is negatively related to individual innovativeness

.

In Pronk et al. (2004) we don't only see obesity as a predictor of work performance, but also the level of physical activity has an impact. As the effects stated earlier are mostly positive, we predict that the effects will also have a positive effect on innovativeness. Therefore, the following hypothesis has been constructed.

H2: The level of physical activity of an individual is positively related to their innovativeness.

Not hypothesized is cardiorespiratory fitness. The reason for this is that in Pronk et al. (2004) the cardiorespiratory fitness level was based on a prediction based on quantitative research. Normally cardiorespiratory fitness levels are measured by a physical fitness test such as the Shuttle-run test or maximal oxygen consumption test. Because of limitations of this study it is impossible to perform these physical fitness tests, which is why cardiorespiratory fitness is excluded in this study and only physical activity and obesity are tested.

3. METHODOLOGY

To answer the research question a quantitative approach is used, a questionnaire is made for this approach. The questionnaire is used to measure the effects of lifestyle-related modifiable health risk factors on innovation. A questionnaire is a generally accepted method within the social sciences, because this method is relatively simple and reliable (Ten Klooster, Visser, & De Jong, 2008).

Together with three other students who did similar Bachelor thesis projects, a questionnaire was made and sent to friends, family members and other acquaintances with direct connections to the students. The target group for the questionnaire was people older than 30 years, who also have been working in the past year and had completed a higher education (HBO or higher). The aim was to get a sample size of at least 100 respondents. After about five days, exactly 99 people had responded to the questionnaire. Because of time constraints the questionnaire was also sent to friends of friends in order to get this number of respondents within a week. This proved to be successful, however it also means that an exact response rate was impossible to report, as it is unknown to how many people the questionnaire was sent. Out of the 99 respondents, 86 fit the target group. These respondents were used to test the hypotheses.

3.1 Dependent variable

The dependent variable of this study is innovative behavior at the individual level. As discussed in chapter two there is a distinction in exploration and exploitation. In Mom et al. (2009) a scale for measuring ambidexterity is made. Seven manager's exploitation activity items and seven manager's exploration activity items are constructed and put into a survey. These items are measured on a seven-point Likert-scale (1 = to a very small extent to 7 = to a very large extent) To have a proper content validity these items are based on features of March (1991, p.71). The scale was further enhanced by Mom et al. (2009) by conducting interviews with managers to alter content and phrasing of the items in the survey. However, these exploitation and exploration activity items are primarily constructed to measure the level of exploration and exploitation for a manager. In this study, respondents are employees of different levels of businesses and not solely managers. This makes the scale of Mom not perfectly tailored for this study, which is why a few altercations have been made to supply this study with appropriate measurements. Two activities in Mom's questionnaire in particular stand out as focused on managerial duties. These activities are: "searching for new possibilities with respect to products/services, processes or markets" and "evaluating diverse options with respect to products/services, processes or markets". These activities have been deemed unfit for this study and therefore have been replaced with different activities found in literature. In a recent study by Vermeulen et al. (2014) the input-throughput-output-performance model was empirically tested on the effects of innovation. In order to do this the study had to define innovation thoroughly. Two of the activities that were used in the Vermeulen et al. (2014) study are used to replace two of the questions from Mom et al.'s activities. The activities from Vermeulen et al. (2014) are factors that are not overlapping with the other activities and are fit to define exploration. The activities are "(ideas about) introducing any new or improved work processes" and "using an external network to exchange information (f.i. with suppliers, universities, competitors etc.) With these activities a new scale for exploration and exploitation has been created.

In order to check for reliability of the exploration and exploitation scale Cronbach's alpha has been calculated. The exploration scale scored 0.859 and the exploitation scale scored 0.789. As both these scores are higher than 0.7 we can assume that the scales are reliable.

3.2 Independent variables

Our dependent variables are two lifestyle-related modifiable health risk factors as defined by Pronk et al. (2004) cardiorespiratory fitness has been deemed unable to be tested in this study as there are limited resources available to conduct this study. The most restraining factor is time, which prevents us from conducting both qualitative and quantitative research which would be necessary to test this variable. Therefore, in this study only obesity and physical activity is tested.

3.2.1 Obesity

Obesity is measure by using the Body Mass Index (BMI). The BMI of a person is a value derived from the mass and height of an individual. The BMI is defined as the body mass divided by the square of the body height, and universally expressed in units of kg/m2 (Keys et al, 1972). In the study performed by Pronk et al. there have been formulated different categories of BMI in order to test this variable. To ensure this study is reliable, we use the same categories as to ensure consistency. BMI was categorized as follows: normal weight (<27 kg/m2), overweight (27-29,9 kg/m2), obese (30-39,9 kg/m2) and morbidly obese (>40 kg/m2). Some studies choose to use a different cut-off point for overweight adults. For example, a study of Chinese adults found a cut-off point of 24 kg/m2 appropriate (Zhou B. F., 2002). The reason we chose for a cut-off point of 27 kg/m2 was that at this point, without any other illnesses, doctors explicitly advise patients to be put on a weight loss regime. These categories of obesity will be tested to see if they're a pre-determinant for innovativeness. Obesity could also have measured as a continuous variable, but has been divided into different categories for several reasons. Firstly, to ensure that this Bachelor's thesis is consistent with the findings in Pronk et al. (2004). Furthermore, when this category is treated as a continuous variable it will mean that not obesity is measured, but rather BMI is measured instead. Even so, while performing the statistical analysis both methods for measuring obesity have been used, but no differences were present in the results. In the results section, only the results with obesity divided into different categories are presented. The BMI will be calculated by $\frac{\text{kg}}{\text{m}^2}$. In order to do this, respondents will have to submit their length and weight.

3.2.2 Physical activity

Previous studies have provided us with a questionnaire to test respondents' physical activity without having to use a practical test. In this study we will use the Godin-Shephard Leisure-Time Physical Activity Questionnaire (GSLTPAQ) (Godin & Shephard, A simple method to assess exercise behavior in the community, 1985). This questionnaire has been validated (Godin, 2011) and has proven to be a reliable measurement of physical activity using a questionnaire. Pronk et al. (2004) have used the same questionnaire for similar reasons. The questions in the GSLTPAQ ask respondents about their physical activity and derive an arbitrary value from their answers. These values add up to a scale of physical activity which will be tested against innovativeness in the regression analysis.

3.3 Control variables

There might be other causes of innovation, for example the experience of someone. An experienced person could have a lot of different perspectives on things and therefore have a high level of innovation. On the contrary, someone with a lot of experience could be working the same function for more than 30 years, making this person very specialized, but not very innovative. These control variables are constant and unchanged throughout the analysis and might prove an alternate explanation for the dependent variable than the independent variable. To control for different types of experience, several control variables have been added. *Age* and *tenure within the firm* are expected to positively relate to a person's individual level of innovativeness (Tushman & O'Reilly, 1996). Also included is a person's *tenure in his or her current function*, this is associated with a high level of specialization and therefore a negative relation with innovation is expected (Gibson & Birkinshaw, 2004). Another cause for innovation might be the *level of education* of the individual. Therefore, a question in the questionnaire is provided to check the education of the respondent. With these control variables it is expected that a significant relation between variables cannot easily be explained by other factors.

3.4 Statistical methods

The dependent variables physical activity and obesity are measured using the mentioned formulas. These will be tested against the dependent variable innovativeness with regression analysis, but first we need to understand the relationships between our variables. To understand this, we use Pearson correlation analysis. Correlation explains the relationship between two variables by (linear) coherence and is expressed by the correlation coefficient. This coefficient ranges from -1 to 1 where -1 is total negative correlation, 0 means no correlation and 1 means total positive correlation. Correlation is widely used in social sciences to show a relationship between different variables, and can be visualized with a scatterplot. However, the correlation analysis does not show causality. To test causality we use a general linear regression model. The general linear model is a generalization of multiple linear regression model to the case of more than on dependent variable. The model will be tested in a univariate manner. In the first calculation of the model, only the control variables will be tested. Then later physical activity is added to the model and in a second test obesity is tested.

4. RESULTS

Table 2 gives an overview of the most important descriptive statistics and shows the results of the correlation analysis. Only the 87 respondents that fit the target group are used in this analysis. In this table there are two nominal variables. These are highest education and obesity. For highest education this means that a value of 1 means High school, 2 is HBO (University of applied sciences), 3 is Bachelor's degree at a university and 4 is Master's degree or higher. For obesity the values are classified as: 1 = normal weight, 2 = overweight, 3 = obese and 4 = morbidly obese. For our dependent variable innovativeness we see that $\mu = 4.65$ and $\sigma = 0.83$. For our independent variable obesity $\mu = 1.33$ and $\sigma = 0.62$ and for physical activity $\mu = 42.70$ and $\sigma = 32.16$. The standard deviation for physical activity seems to be quite large. There can be multiple explanations for this. For example, someone read the question regarding this variable wrong in the questionnaire or a typo could have been made. To check for outliers a scatterplot has been made.

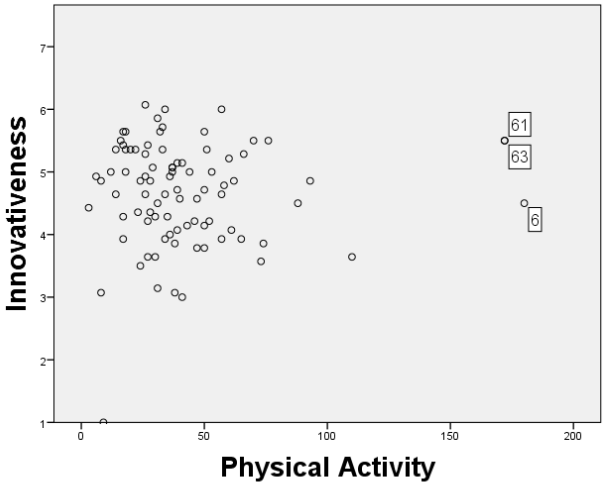

Figure 1: Scatter plot of innovativeness and physical activity

As suspected there are outliers for this variable. Case 6, 61 and 63 have considerably high values and after evaluation of these specific cases they have been removed from the results, leaving us with 84 respondents to work with during the regression analysis. After removing these respondents, we checked the descriptive data again to see how it has changed. For physical activity now $\mu = 37.99$ and $\sigma = 20.47$. Albeit still a bit high, the new standard deviation is a huge improvement.

Table 2: Descriptive statistics and correlations

	Mean	Min/Max	S	Age	Highest Education	Tenure	Tenure Position	Obesity	Physical Activity	Innovativeness
Age	43.77	30/67	9.72	1						
Highest Education	3.08	2/4	.97	.069	1					
Tenure	10.93	1/35	9.45	.654**	.045	1				
Tenure Position	5.16	0/35	6.61	.499**	.034	.423**	1			
Obesity	1.33	1/3	.62	.113	-.180	.203	.190	1		
Physical Activity	42.70	3/180	32.16	-.007	-.052	.095	-.016	-.062	1	
Innovativeness	4.65	1/6.04	.83	-.082	.045	-.064	-.091	.183	.064	1

Notes: *p < .05 (two-tailed); **p < .01 (two-tailed). S = Standard deviation

When we look at the correlations in table 2 we see that three significant correlations have been found. We see a correlation between age and tenure as well as age and tenure position. The third correlation is tenure and tenure position. These correlations are all significant at the 0.01 level. Of course, these correlations are natural and expected, as age and tenure are directly connected. The older you get, the more years you would have been able to have worked. Our dependent and independent variables show no significant correlation in this analysis. However, we can still take a look at the correlations to see if something interesting comes up, while keeping in mind that these correlations are not significant. Against our expectations, there appears to be a positive correlation between obesity and innovativeness. This is not in line with our first hypothesis: *Obesity is negatively related to individual innovativeness*. There can be a number of explanations for this, but before we can make any conclusions we have to test for causality first using regression analysis. Physical activity appears to have a positive correlation with innovativeness, though it is a very small one with a correlation of 0.064. As seen in the scatter plot in figure 1, barely any correlation is visible.

To test for causation a general linear regression analysis has been performed three times. Once with a baseline model which only has the control variables to test whether or not the control variables correctly predict innovativeness. And two more times with the dependent variables physical activity and obesity added to see the effects of these variables on innovativeness. The findings of the regression analysis are presented in table 3.The first thing we notice when we look at the results is that for all the different models the corrected model is not significant. This means that the models do not accurately reflect upon all the main effects and interactions between the variables. This is bit of a setback, as it means that we can't come to any significant conclusions by using the regression analysis. When we look at the significance of the corrected models we see that for the baseline model a significance of .527 has been calculated, for the baseline model + obesity a significance of .137 has been reported and the baseline model + physical activity has a significance of .630. As we can see the model with obesity has the most significance, though it is still not enough. Nevertheless, we can still look at the different outcomes of the analysis to see if any interesting results come up.

When we look at the adjusted R2 the baseline model gives a value of adj. R2 = -.010. This negative value can be interpreted the same as 0. The adjusted R2 means that the independent variables explain 0% of the variations of innovativeness. An explanation why the adjusted R2 is so low could be that the sample size is too low. One of the interesting things we see in the analysis is that the adjusted R2 for the baseline model + obesity rises to .055, which means that now 5.5% of the variations in innovativeness are explained by the independent variables. This increase leads us to believe that obesity might indeed have an effect on innovativeness, though because of the insignificance of the model this is not reliable enough.

When we look at the independent variables in table 3 we see that neither obesity nor physical activity have a significant effect on innovativeness. For obesity p-values of .155 and .692 have been reported. For physical activity a p-value of .705 has been reported. Although the regression model is not significant and therefore no real conclusions can be made, it is not proven that either obesity or physical activity have an effect on innovativeness.

Based on these results, we must reject our hypothesis: **Obesity is negatively related to individual innovativeness**. Obesity does not significantly predict innovativeness in our model with p = .155 when comparing obese subjects with normal weight and p = .692 when comparing obese subjects with overweight subjects. We must also reject our second hypothesis: **The level of physical activity of an individual is positively related to their innovativeness**. Physical activity does not significantly predict innovativeness in our model with p = .705.

5. DISCUSSION

In this section we first discuss the theoretical implications of this study. We take a look at the place this study has in the current theoretical framework and how it has built on that foundation. Secondly we discuss the contribution this bachelor's thesis has made for practical implications.

Table 3: Multiple regression analyses to explain innovativeness

	Baseline model		Baseline model + obesity		Baseline model + physical activity	
	B	Sig.	B	Sig.	B	Sig
Control variables						
Intercept	4.982	.000	5.442	.000	5.072	.000
Gender: female	-.357	.145	-.252	.294	-.353	.152
Gender: male	.000[a]		.000[a]		.000[a]	
Education: HBO	-.117	.546	-.203	.295	-.119	.543
Education: Bachelor's at a university	.407	.336	.537	.197	.413	.332
Education: Master's or higher	.000[a]		.000[a]		.000[a]	
Age	-.003	.812	-.004	.780	-.004	.777
Tenure	-.004	.791	-.009	.486	-.003	.809
Tenure in position	-.014	.450	-.021	.253	-.014	.459
Independent variables						
Weight: normal			-.486	.155		
Weight: overweight			.157	.692		
Weight: obese			0[a]			
Physical activity					-.002	.705
R2		.063		.146		.065
Adj. R2		-.010		.055		-.021
	Df		Df		Df	
Corrected model	6	.527	8	.137	7	.630

Notes: N = 84; *p < .05; **p < .01; a: This parameter is set to zero because it is redundant.

5.1 Theoretical implications

Current literature on finding pre-determinants of innovation mainly focus on the team-level or organizational level of analysis. Studies on the individual level of analysis do exist, but this area is lacking in studies compared to the team-level and organizational level of analysis. The individual characteristics that have been studied focus on demographic factors such as age and personality factors. This study aims to complement existing studies on the individual level by testing causation between physical characteristics of individuals against their innovativeness. Physical characteristics had not yet been tested on innovativeness but a study by Pronk et al. (2004) had tested modifiable lifestyle-related health risk factors against different work performance. Two of the health risk factors used in that study was tested in this study against innovativeness. Obesity was rejected as having an impact on innovativeness as well as physical activity. These findings do not indicate that modifiable lifestyle-related health risk factors have an effect on innovativeness, though the study could be elaborated upon by having a larger sample size in the questionnaire to have more reliable data to test the hypotheses with.

5.2 Practical implications

In drawing practical implications the data does not support that organizations alter any of their business based solely on this bachelor's thesis. No hypotheses were accepted and although other studies suggest that there is merit to minimizing obesity and maximizing physical activity of individuals for better work performances (Pronk, Martinson, Kessler, Beck, Simon, & Philip Wang, 2004), no indication has been found that this has an effect on innovativeness.

6. LIMITATIONS AND FUTURE RESEARCH

The first limitation of this study is the sample size. With five control variables and several independent variables the regression analysis could not provide satisfactory results. With a large sample size the effect of having multiple variables in a regression analysis would be diminished and more reliable conclusion could be made based on the data.

Furthermore, this study was limited by time constraints and could only conduct quantitative research. Had qualitative research been an option a third independent variable could have been researched. Particularly cardiorespiratory fitness could be

a predictor of innovativeness, it is the only modifiable lifestyle-related health risk provided by Pronk et al. (2004) that is not assessed in this bachelor's thesis.

Another limitation of this study is generalizability. It raises a question whether our respondents, which were selected by asking friends, relatives and acquaintances, are generalizable to people with different backgrounds. Therefore, it might prove interesting to see if this research would provide different results when performed in another country, for instance.

For future research on this topic, we suggest that to take a closer at the operationalization of innovativeness. For operationalizing innovativeness a scale provided by Mom et al. (2011) was used and slightly altercated. Although the scale was proven to be reliable based on the Cronbach alpha scores, different approaches to operationalizing innovation do exist and could provide a different perspective on this topic.

Also, we only tested for linear relationships between variables. Non-linear effects might exist.

Even though no predictors for innovation based on physical factors of an individual have yet been found, there is still not a lot of literature on this connection and further research might unveil new insight.

7. BIBLIOGRAPHY

Ancona, D. G., & Caldwell, D. F. (1987). Management issues facing new-product teams in high technology companies. *Advances in Industrial and Labor Relations*.

Anderson, N. R., & West, M. A. (1998). Measuring climate for work group innovation: development and validation of the team climate inventory. *Journal of Organizational Behavior*, 235-258.

Balau, G., Faems, D., & Van der Bij, H. (2012). Individual Characteristics and Their Influence on Innovation: A Literature Review. *PROCEEDINGS OF THE 9TH INTERNATIONAL CONFERENCE ON INNOVATION AND MANAGEMENT*, 887-901.

Beckman, C. M., Haunschild, P. R., & Philips, D. J. (2004). Friends or Strangers? Firm specific uncertainty, Market uncertainty and Network partner selection. *Organization Science*, 259-275.

Cohen, W. M., & Levinthal, D. A. (1990). Absorptive Capacity: A New Perspective on Learning and Innovation. *Administrative Science Quarterly*, 128-152.

Conway, S., & Steward, F. (2009). *Managing And Shaping Innovation*. Oxford: Oxford University Press.

Damanpour, F. (1990). Organizational innovation: a meta-analysis of effects of determinants and moderators. *Academy of Management Journal*, 555-590.

De Visser, M. (2013). Individual, team, and organizational antecedents of explorative and exploitative innovation in manufacturing firms. Zutphen: CPI Woehrmann Print Service.

Gibson, C. B., & Birkinshaw, J. (2004). The antecedents, consequences and mediating role of organizational ambidexterity. *Academy of Management Journal, 47*, 209-226.

Gnyawali, D. R., & Srivastava, M. K. (2013). Complementary Effects of Clusters and Networks on Firm Innovation: A Conceptual Model. *Journal of Engineering and Technology Management, 30*(1), 1-20.

Godin, G. (2011). The Godin-Shephard Leisure-Time Physical Activity Questionnaire. *Health & Fitness Journal, 4*(1), 18-22.

Godin, G., & Shephard, R. J. (1985). A simple method to assess exercise behavior in the community. *Canadian Journal of Applied Sport Sciences, 10*(3), 141-146.

Jansen, J. J. (2005). Ambidextrous Organizations: A Multiple-Ambidextrous Organizations: A Multiple-Level Study of Absorptive Capacity, Level Study of Absorptive Capacity, Exploratory and Exploitative Innovation and Performance. *Erasmus University Rotterdam*, 19.

Katila, R., & Ahuja, G. (2002). Something old, something new: a longitudinal study of search behavior and new product introduction. *45*(6), 1183-1194.

Keys, A., Fidanza, F., Karvonen, M. J., Kimura, N., & Taylor, H. L. (1972). Indices of relative weight and obesity. *J Chronic Dis, 25*, 329-343.

Lavie, D., & Rosenkopf, L. (2006). Balancing Exploration and Exploitation in Alliance Formation. *Academy of Management Journal*, 797-818.

Levinthal, D., & March, J. G. (1993). Myopia of learning. *Strategic Management Journal, 14*, 95-112.

March, J. G. (1991). Exploration and exploitation in organizational learning. *Organization Science, 2*, 71-87.

Miles, R. E., & Snow, C. C. (1978). *Organizational strategy, structure, and process.* New York: McGraw-Hill Book Co.

Mom, T. J., Van den Bosch, F. A., & Volberda, H. W. (2009). Understanding Variation in Managers' Ambidexterity: Investigating Direct and Interaction Effects of Formal Structural and Personal Coordination Mechanisms. *Organization Science, 20*(4), 812-828.

Papadakis, V., & Bourantas, D. (1998). The Chief Executive Officer as corporate champion of technological innovation: an empirical investigation. *Technological Analysis and Strategic Management, 10*(1), 89-109.

Porter, M. E. (1990). *The Competitive Advantage of Nations.* New York: Free Press.

Pronk, N. P., Martinson, B., Kessler, R. C., Beck, A. L., Simon, S. E., & Philip Wang, M. D. (2004). The Association Between Work Performance and Physical Activity, Cardiorespiratory Fitness, and Obesity. *Journal of Occupational and Environmental Medicine, 26*(1), 19-25.

Pronk, N. P., Tan, A. W., & O'Connor, P. (1999). Obesity, Fitness, and health care costs. *Medicine & amp Science in Sports & amp Exercise Journal, 1*(31).

Rothaermel, F. T., & Alexandre, M. T. (2009). Ambidexterity in Technology Sourcing: The Moderating Role of Absorptive Capacity. *Organization Science*, 759-780.

Rothaermel, F. T., & Deeds, D. L. (2004). Exploration and exploitation alliances in biotechnology: a system of new product development. *Strategic Management Journal*, 201-221.

Schumpeter, J. A. (1934). *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest and the Business Cycle.* Cambridge, MA: Harvard University Press.

Schumpeter, J. A. (1942). *Capitalism, Socialism and Democracy.* New York: Harper.

Sørensen, J. B., & Stuart, T. E. (2000). Aging, Obsolescence and Organizational innovation. *Administrative Science Quarterly 45*, 81-112.

Stewart, G. L. (2006). A meta-analytic review of relationships between team design features and team performance. *Journal of Management*, 29-54.

Ten Klooster, P. M., Visser, M., & De Jong, M. D. (2008). Comparing two image research instruments: The Q-sort method versus the Likert attitude questionnaire. *Food Quality and Preference, 19*(5), 511-518.

Tripsas, M. (2009). Everybody in the Pool of Green Innovation. *The New York Times*.

Tushman, M. L., & O'Reilly, C. A. (1996). The ambidextrous organization: managing evolutionary and revolutionary change. *California Management Review*, 1-23.

Vermeulen, P. A., De Jong, J., & O'Shaughnessy, K. C. (2003). *Innovation in SMEs: An Empirical Investigation of the Input-Throughput-Output-Performance Model.* EIM Business and Policy Research.

West, M. A. (1987). A measure of role innovation at work. *British Journal of Social Psychology, 26*(1), 83-85.

West, M. A. (1990). The social psychology of innovation in groups. *Innovation and creativity at work*, 309-333.

West, M. A., & Farr, J. L. (1989). Innovation at work: Psychological perspective. *Social Behavior*, 15-30.

Woodman, R. W., Sawyer, J. E., & Griffith, R. W. (1993). Toward a theory of organizational creativity. *Academy of Management Review*, 293-321.

Zhou, B. F. (2002). Predictive values of body mass index and waist circumference for risk factors of certain related diseases in Chinese adults--study on optimal cut-off points of body mass index and waist circumference in Chinese adults. *Biomed Environ Sci, 15*(1), 83-96.

Zhou, J., & George, J. M. (2001). When job dissatisfaction leads to creativity: encouragin the expression of voice. *Academy of Management Journal, 41*(4), 682-696.

Zibarras, L. B., Woods, S. A., & Port, R. L. (2011). Innovation and the 'Dark Side' of Personality: Dysfunctional Traits and their Relation to Self-Reported Innovative Characteristics. *The Journal of Creative Behavior, 42*(3), 201-2015.