



THE INFLUENCE OF THE POSITIVE AND NEGATIVE DIMENSIONS OF SELF- COMPASSION ON THE ENGAGEMENT IN PHYSICAL ACTIVITY

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Abstract

Background

Engaging in health promoting behaviors has been a focal point for research during the past years. Worldwide, people are not sufficiently engaging in physical activity, even though the risks of not undertaking the health behavior are immense. Thus, there is an urgency to find new ways of encouraging and aiding people to immerse in physical activity.

Aim

Research has provided evidence that self-compassion is associated with health protective behaviors, therefore this study's purpose was to determine how the two dimension of self-compassion, that is self-coldness and self-compassion, are associated with physical activity.

Methods

A total of 133 participants (mean age = 40, SD = 16.32) was recruited in a convenience sample to take part in the online survey. The questionnaire included the Self-Compassion Scale, the International Physical Activity Questionnaire as well as a single item about physical activity on the Wellness Behavior Inventory Questionnaire.

Results

Pearson correlations revealed that physical activity measured by the WBI-PA is significantly weak and negative related to self-coldness ($r = -.17, p < .05$). No significant relationship could be found between self-compassion and physical activity ($r = .12, p = .175$). A significant moderate and negative relationship was discovered between self-coldness and self-compassion ($r = -.47, p < .01$). A linear regression analysis established that 3% of the variance of physical activity could be attributed to self-coldness ($F_{(1,132)} = 4.10, p < 0.05, R^2 = .03$).

Conclusion

This current study supports the distinction between the positive dimension self-compassion and the negative dimension self-coldness. Additionally, it established that the definitions of self-compassion are varying between the positive dimension and the total score of the SCS. Furthermore, it presents self-coldness as possible inhibitor of adherence to physical activity levels and consequently, might open new possibilities for further interventions to maximize physical activity levels by implementing innovative approaches including the reduction of self-coldness levels in individuals.

Keywords: Self-Compassion, Self-Coldness, Physical Activity

Introduction

According to the World Health Organization (2009), 60% of an individual's quality of health and overall life are attributable to their behavior and lifestyle. In order to achieve a decline in preventable diseases and deaths, a conscious shift in a person's health behavior needs to take place. Rather than engaging in health risk behaviors, people should commit to health promoting practices (Glanz, Rimer & Viswanath, 2008). Health promoting behaviors are described as demeanors executed to protect, promote and maintain health, such as for example dieting or exercising (Morrison & Bennett, 2016). Health risk behaviors on the other hand are actions which increase the chance of adverse health outcomes, such as heart disease or cancer. Amongst others, health risk behaviors include a high body mass index as well as the use of alcohol and tobacco (World Health Organization, 2009). Engagement in health promoting behaviors has grown to be the focus of various researches conducted all over the world. Dietary behavior, physical activity and stress management are only a few examples of health promoting behaviors (Wang, Ou, Chen & Duan, 2009). The current study targets the health behavior physical activity.

Physical Activity

According to the World Health Organization (n.d.), physical activity can be defined as each movement performed by muscles to the expense of energy. Deficiencies in the engagement of physical activity have been determined to be the fourth most dominating factor of death worldwide. Furthermore, lack of physical activity is the predominant reason for approximately 21 – 25% of breast and colon cancers, 27% of diabetes and additionally 30% of ischaemic heart disease (World Health Organization, n.d.). Physical activity should not be misconstrued as exercising, which is expressed as an organized, repetitive and purposeful action with the aim of continuing or improving various segments of physical fitness (Caspersen, Powell & Christenson, 1985). Physical activity has repeatedly proven to benefit an individual's overall health. It demonstrates peculiar efficacy in the prevention of various chronic conditions such as cardiovascular disease, diabetes, cancer, obesity and osteoporosis (Warburton, Nicol & Bredin, 2006). Regular physical activity heightens the life expectancy of an individual by 0.4 up to 6.9 years (Reimers, Knapp & Reimers,

2012). Moreover, it also has an influence on psychological well-being. Research shows that reduced symptoms of depression, anxiety and stress are correlated with physical activity. In addition, it has been shown to serve as promoter of self-esteem (Calfas & Taylor, 1994).

Despite the aforementioned benefits regular physical activity produces, many people are not engaging in this demeanor to a sufficient level. The recommended level of physical activity involves 60 minutes daily for children and youths 5 to 17 years old and 150 minutes daily for adults 18 to 64 years old (World Health Organization, n.d.). It is estimated that around 82.1 million people living in America, which depicts to be 25% of the overall population, are physically inactive (Physical Activity Council, 2019). In addition, only 50% of the adult population and 31% of adolescents are engaging in sufficient physical activity in the Netherlands (World Health Organization, 2018). Previous attempts to increase physical activity levels have mainly focused on the use of tools such as the pedometer (Bravata et. al., 2007), mandatory expansions in school-based physical activity (Harris, Kuramoto, Schulzer & Retallack, 2009) and interventions located at the workplace (Conn, Hafdahl, Cooper, Brown & Lusk, 2009). According to Biber and Ellis (2017), self-regulation of health behaviors is positively influenced by a person's level of self-compassion. Thus, self-compassion might be a key to improve adherence to recommended physical activity levels.

Self-compassion

Self-compassion is described as being approachable to one's own pain, developing ambition and devotion to relieve the discomfort of agonizing feelings and consequently rehabilitate by practicing kindness toward oneself. According to Neff, Kirkpatrick and Rude (2006) higher levels of self-compassion are related to an increase in psychological well-being. In particular, the concepts of greater life satisfaction, emotional intelligence, social connectedness, curiosity, happiness and optimism have been found to be associated with self-compassion. Moreover, a decrease of self-criticism, depression and anxiety has been determined to be related to self-compassion (Neff, 2009). Self-compassion can be divided into three essential components each with a positive and a negative dimension. It includes self-kindness versus self-judgement, common humanity versus isolation and lastly, mindfulness versus over-identification (Neff, 2003).

The first component includes the positive dimension of self-kindness. It encompasses an individual's recognition of being imperfect, unsuccessful and being confronted with difficulties in

life as imminent and therefore reacting with kindness and understanding towards himself. The negative dimension of this component comprises self-judgement, which consists of rough criticism, anger and frustration directed toward oneself when individuals refuse to accept the inevitable situation. The second element consists of the positive aspect of common humanity, which involves being able to see one's own experiences as belonging to greater human existence and thus, acknowledging that suffering is shared by everyone rather than only experienced by oneself. The counterpart of this concept is isolation, which contains viewing own experiences as separate from shared human experience. Lastly, the third component consists of the positive dimension mindfulness, which entails maintaining one's suffering feelings and thoughts in a fair balanced realization. This further involves that an individual should accept one's feelings as they are without restraining or magnifying them. The negative dimension of this component includes the over-identification with or ignorance of these painful feelings (Neff, 2003).

Although Neff proposed an overall model measuring self-compassion which involves the balanced incorporation of positive and negative dimensions, López et al. (2015) introduced a two-factor division of the scale. The researchers suggested to separate the positive formulated items, that is self-kindness, common humanity and mindfulness, from the negative components which include self-judgement, isolation and over-identification. While the positive dimension constitutes a level of self-compassion, the negative dimension composes a position on a person's self-coldness (López, Sandermann & Schroevers, 2018). There is existing evidence that the two dimensions, self-compassion and self-coldness respectively, are differently associated with diverse psychological constructs. For example, research showed that self-coldness relates strongly with depressive symptoms, whereas self-compassion on the other hand correlated only moderately with depressive symptoms (Gilbert, McEwan, Matos, & Rivis, 2011). Another study discovered that self-compassion correlated stronger with well-being, while self-coldness was more strongly associated with distress (Brenner et al., 2018). Furthermore, the researchers detected that self-compassion acts as a buffer in the relationship of self-coldness and distress, which serves an additional indicator to treat self-compassion and self-coldness as distinct concepts.

The relationship between physical activity and self-compassion

As aforementioned, research has proven that self-compassion is positively correlated with the practice of health promoting behaviors such as dietary and sleeping behaviors as well as stress management. (Sirois, Kitner & Hirsch, 2015). Especially the health promoting behavior of physical activity has repeatedly been established to be related with self-compassion (Dunne, Sheffield & Chilcot, 2018; Sirois, Kitner & Hirsch, 2015). Therefore, a new and innovative approach to increase levels of physical activity could include the concept of self-compassion. However, what has not yet been determined is whether the negative or positive dimension of self-compassion are associated with the engagement in physical activity and if they relate distinctly to physical activity. Neff (2003) suggests that the positive and negative dimensions of self-compassion are not completely opposite, but rather a balanced approach between the two dimensions of each element is leading to a self-compassionate individual. Nevertheless, dividing the concept into two separate constructs might present differences with regards to the engagement in physical activity and consequently touch an entirely new field which has not been researched yet. In other words, the question arises whether the engagement in physical activity is dependent on one's level of compassion and the need to do something good for one's health or if it is restrained and reduced because of one's level of coldness.

Considering the aforementioned material, the following research question arises: *'Which dimension of **self-compassion** is stronger related to **physical activity**: the positive dimension of self-compassion (self-kindness, common humanity, mindfulness) or the negative dimension called self-coldness (self-judgement, isolation, over-identification)?'*

Study hypotheses

Based on the aforementioned literature, it is profoundly essential to investigate the relationship between the two dimensions of self-compassion and physical activity.

According to Giles-Corti and Donovan (2003), adherence to recommended walking behavior was increased by 45% when people had a positive attitude towards it. Due the fact that self-compassion consists amongst others of self-kindness and is thus, positively influenced, it is therefore assumed that the relationship between self-compassion and physical activity is positive. Moreover, it is presumed that self-coldness correlates negatively with physical activity levels since previous research has provided evidence with respect to how distinct the two concepts relate to various concepts (Gilbert, McEwan, Matos, & Rivis, 2011). Furthermore, as both dimensions are derived from one scale, it can be concluded that they are related to some degree. However, since previous studies have shown that they appear to measure two different constructs, a negative moderate correlation is to be expected between self-compassion and self-coldness.

Lastly, to answer the aforementioned main research question, it is expected that self-compassion is stronger related to physical activity than self-coldness, because research has repeatedly proven that self-compassion is related to the engagement in physical activity (Mosewich et al. 2011; Biber & Ellis, 2017).

(1) To determine the relationship between the self-compassion, self-coldness and physical activity.

H1_a: Self-compassion correlates positively with levels of physical activity.

H1_b: Self-coldness correlates negatively with levels of physical activity.

H1_c: There is a moderately negative relationship between self-compassion and self-coldness.

H1_d: Self-compassion is stronger related to physical activity than self-coldness.

Methods

Design

In order to investigate the relationship between the positive dimension self-compassion, the negative dimension self-coldness and physical activity, a quantitative cross-sectional online-survey was conducted. A convenience sample was provided with standardized questionnaires as a means to collect data.

Participants and Procedure

In order to take part in the study, participants had to meet certain requirements. Inclusion criteria consisted of being at least 18 years of age and to be not older than 69 years of age since this depicted to be a condition of one of the measurement instruments. Moreover, they had to have proficient knowledge in the English or German language as the questionnaires were distributed in both languages. The data was collected in collaboration with three other students. The researchers invited people from their personal network to participate in the study through E-Mail and social networking sites such as Facebook, Instagram or WhatsApp. Additionally, it was made use of SONA-Systems, which is an internal university program in which students are able to receive credits for the participation in the research.

The study concentrated on a sample ($n = 305$) of which 83 participants needed to be excluded due to the termination of the questionnaire before finishing it. Moreover, five participants were removed because they were over the age of 69. Lastly, the scoring of the International Physical Activity Questionnaire (IPAQ) demanded to exclude further 84 people, which will be explained in more detail in the following section. For that reason, the final number of participants consisted of 133 people.

Before granting people access to the survey, the ethical committee of the Faculty of Behavior, Management and Social Sciences of the University of Twente was approached for approval. After the research has been accepted, data was collected between April 28th and May 9th 2019. By means of an electronic link to access the survey, participants first encountered a short explanation of self-compassion and the purpose of the study, which are the Bachelor theses of the four researchers. Afterwards, participants were confronted with an informed consent which

included information about confidentiality, anonymity, the estimated duration of the questionnaire (20 minutes), the option to withdraw at any given time and contact information for further questions. Following the participants agreement, demographical questions were asked and subsequently the actual questionnaire started which included six different scales measuring various psychological and physical constructs.

Measuring instruments

The online survey contained six topics. First, demographics of the participants were asked. Next, self-compassion and self-coldness were investigated. Subsequently, another measure of self-compassion was administered. Afterwards, the level of physical activity participants engage in was determined. Then, various protective health behaviors people undertake were examined, followed by an exploration of the mental health status of participants. Lastly, various physical symptoms of the participants were researched.

In order to answer the aforementioned research questions, this study included four instruments which will be further elaborated on in the following paragraphs.

Demographics were examined by means of seven questions at the beginning of the survey. First, questions were asked which investigated the studied populations' age, gender they identify with and their nationality. Consequently, the education level was explored by asking for the highest degree earned. This multiple-choice question included seven answering options ranging from 'less than high school diploma' to 'Doctorate degree'. Afterwards, participants were asked to disclose their current occupational status by selecting from nine answering options ranging from 'Full-time employee' to 'Retired'. Lastly, two questions concerned the studied populations' health status and investigated whether participants are suffering from any chronic disease or if they have any physical constraints. Both questions could be answered with 'yes' or 'no'. If the option 'yes' was selected, participants were asked to specify their condition.

Self-compassion (SC) was measured by means of the three-dimensional Self-Compassion Scale Short Form (SCS-SF) developed by Neff (2003). Both, the English and German version of the scale consist of 12 items which can be answered on a five-point Likert Scale (1 = 'Almost never' to 5 = 'Almost always'). López et al. (2015) proposed to divide the items into two

dimensions. While three of these subscales are positively formulated and build the level of self-compassion, the other three are defined in a negative manner and thus, assess the level of self-coldness. The aforementioned positive subscale consists of six items: two elements of the Self-Kindness scale ('I try to be understanding and patient towards those aspects of my personality I don't like'), two components of the Common Humanity scale ('I try to see my failings as part of the human condition') and two items of the Mindfulness subscale ('When something upsets me I try to keep my emotions in balance'). The positive dimension, that is self-compassion, of the 6-item SCS showed acceptable internal consistency ($\alpha = 0.75$).

The negative subscale of the SCS consists likewise of six items: two elements of the Self-Judgement subscale ('I'm disapproving and judgemental about my own flaws and inadequacies'), two items of the Isolation component ('When I fail at something that's important to me, I tend to feel alone in my failure') and lastly two items of the Over-Identification subscale ('When I'm feeling down I tend to obsess and fixate on everything that's wrong'). The negative dimension of the SCS, that is self-coldness, presented with good internal consistency ($\alpha = 0.83$). This current research used the sum score of the positive items as measure of self-compassion and the sum score of the negative items as measure of self-coldness. The scores on each dimension may range from 6 to 30 with higher scores indicating greater levels of self-compassion and self-coldness respectively.

Additionally, a total score of the Self-Compassion Scale has been computed to test whether there are differences with regards to the distinct positive and negative dimensions. In order to achieve a total scale score, the negative items had to be reverse coded. Afterwards, the mean of each scale was computed, followed by the summation of the six subscales' mean score. The score can range from 1 to 5 with higher scores displaying greater levels of self-compassion. The overall reliability of the SCS was considered good ($\alpha = 0.84$).

Physical activity (PA) was investigated by the use of the International Physical Activity Questionnaire Short Form (IPAQ-SF; 2002) as well as a single item on the Wellness Behaviors Inventory Scale (WBI-PA) by Sirois (2001; 2019). The IPAQ identifies the level of activity an individual engages in by taking into consideration the past seven days of young and middle-aged adults (15-69) through open ended questions. Both, the English as well as the German version of

the questionnaire consist of five items which contain questions assessing the activity level in three areas. These areas comprise vigorous and moderate physical activity as well as walking behavior. The first area covers two items on vigorous physical activity ('During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling?'). Next, the field of moderate physical activity includes two questions ('During the last 7 days, on how many days did you do moderate physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis?'). Lastly, two items on walking behavior were asked ('During the last 7 days, on how many days did you walk for at least 10 minutes at a time?'). Each of the three areas asked for a total of days and the minutes on one of these day in which people engaged in the various levels of physical activity. By means of a formula (see Appendix F), a continuous score was computed for each area which measured intensities in METs, that is minutes per week. Afterwards, the sum of the three areas comprised a total MET-score. The higher the number on this score, the more physical active participants are. Total scores of over 6720 MET per week needed to be excluded, due to the fact that one assumes people get eight hours of sleep each day which would be not possible with a number exceeding the aforementioned count. Moreover, a truncation rule took effect to avoid over-identification with people who are considered highly physical active. Therefore, this rule included that all values on each of the three aforementioned subscales above 180 will be reported as equal to 180. Overall, the IPAQ in this current research has been shown to have an acceptable internal consistency ($\alpha = .62$).

The second measurement for physical activity contains a single item of the Wellness Behavior Inventory Scale ('I do physical activity every day (30 minutes or more)'). The item could be answered on a five-point Likert scale (1 = 'Never' to 5 = 'Always') with higher scores indicating higher levels of physical activity.

Statistical analyses

In order to analyze and process the data, the statistical program SPSS v25 (IBM 2015) was used. First, Means, Standard Deviations, Minimum, Maximum and Range of each scale were computed to investigate the data set and its distribution. Thereupon, Pearson correlation analyses were performed to assess the univariate correlations between the variables physical activity, the positive dimension of self-compassion and self-coldness. Moreover, the total scale score of the SCS was included to find out whether differences exists in comparison to the distinct scales. Lastly, regression analyses were carried out to examine the explained variance of the positive dimension of self-compassion and self-coldness in physical activity. Therefore, first a multiple regression was administered to find out about the explained combined variance in physical activity, followed by a simple linear regression to identify the variance in physical activity to be attributed to self-coldness.

Results

Below, we will first present characteristics of the studied population. Afterwards, general descriptives will be displayed followed by the univariate correlations of the variables. Lastly, the results of the regression analyses between the two dimensions of self-compassion and physical activity will be discussed.

Description of the study group

Table 1 illustrates the general characteristics of the participants. Female participants were the majority with almost three quarters of the studied population. The age distribution covered ages from 18 to 69 ($M = 40.0$; $SD = 16.32$). A further aspect to mention is the unequal distribution of nationalities. Almost all participants were from Germany, while only 6% were from other countries. While almost half of the participants have a high school diploma or an equivalent degree, only 15.8% have less than a high school degree and twice as much people have a Bachelor's degree or higher (31.6%). The majority of participants were either students or full-time employees. No unemployed people took part in the study. Lastly, every 11th person who took part in the study is physically constrained and every eighth person is suffering from a chronic condition.

Table 1

Characteristics of Participants (N = 133).

<i>Item</i>	<i>Category</i>	<i>Frequency</i>	<i>%</i>
Age	18 to 25	52	39.1
	26 to 35	7	5.3
	36 to 45	6	4.5
	46 to 55	43	32.3
	56 to 65	24	18.0
	66 and up	1	0.8
Gender	Male	37	27.8
	Female	96	72.2
Nationality	Dutch	2	1.5
	German	125	94.0
	Other	6	4.5
Education	Less than high school diploma	21	15.8
	High school graduate	57	42.9
	Bachelor's degree	17	12.8
	Master's degree	16	12.0
	Doctorate degree	9	6.8
	Other	13	9.8
Occupation	Full-time employee	40	30.1
	Part-time employee	14	10.5
	Unemployed	0	0
	Self-employed	21	15.8
	Student	41	30.8
	Trainee	2	1.5
	Still in school	1	0.8
	Retired	6	4.5
	Other	8	6.0
Chronic Diseases	No	117	88.0
	Yes	16	12.0
Physical constraints	No	121	91.0
	Yes	12	9.0

Descriptive statistics

Means, Standard Deviations, Minimum, Maximum and Range were computed to get insights into the distribution and variance of the data. Interestingly, the mean score of participants' level on the positive dimension as well as the total score of the SCS is identical. Another feature to call attention to is the level on the positive dimension self-compassion, self-coldness, the total score of the SCS and the WBI-PA. In order to interpret the data, cut-off scores for this particular study were made at the value of 2.5 for each scale except the IPAQ since it was measured in METs. The results indicate that participants scored low on a concept when it was below the value of 2.5 and high when it was above 2.5. Thus, it can be stated that none of the below displayed concepts was considered low. Especially the WBI-PA pointed out an average of high physical activity among the participants.

Table 2

Means, Standard Deviations, Minimum, Maximum and Range for Each Scale.

<i>Scales</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Range</i>
SCS					
Self-compassion	3.3	.8	1.2	5.0	3.8
Self-coldness	3.4	.9	1.0	5.0	4.0
Total Score SCS	3.3	.7	1.4	4.8	3.4
IPAQ	3348.8	1708.4	99.0	6666	6567.0
WBI-PA	4.1	.8	1.0	5.0	4.0

Correlations

In order to test hypothesis 1_a, 1_b and 1_c separate Pearson correlations were conducted (Table 3). First, univariate correlations between the positive dimension of self-compassion and physical activity were administered. Self-compassion and the IPAQ showed no significant linear relationship ($r = -.02$; $p = .819$). Furthermore, self-compassion and the WBI-PA have also displayed no significant linear relationship ($r = .12$; $p = .175$). In conclusion, it can be stated that the requirements to fulfill hypothesis 1_a have not been met and thus, the hypothesis is rejected.

Table 3

Correlations of Self-compassion, Self-coldness, the Total Score and physical activity.

<i>Scale</i>	<i>Self-compassion</i>	<i>Self-coldness</i>	<i>Total Score SCS</i>	<i>IPAQ</i>	<i>WBI-PA</i>
Self-compassion	1	-.47**	.83**	-.02	.12
Self-coldness	-.47**	1	.88**	.03	-.17*
Total Score SCS	.83**	-.88**	1	-.03	.17*

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Next, correlations between self-coldness and physical activity were computed. Self-coldness and the IPAQ have no significant linear relationship ($r = .03$; $p = .740$). Contrary, the WBI-PA has shown a weak negative relationship with self-coldness, which is significant ($r = -.17$; $p = .045$). Participants who scored high on self-coldness would engage in lower physical activity and vice versa. To conclude, it can be declared that hypothesis 1_b is able to fulfill its requirements and can therefore be accepted.

Lastly, a correlation between the positive dimension of self-compassion and self-coldness was computed. The correlation between the variables was found to be moderate and significantly

negative ($r = -.47; p = 0.01$). Participants who scored high on self-compassion, scored low on self-coldness or vice versa. Therefore, it can be stated that hypothesis 1_c is accepted.

Additionally, the table further provides correlations of the total scale score of the SCS with other constructs. The total scale score measured participants' level of self-compassion correspondingly. As aforementioned, the total score has been included to establish possible differences between the distinct dimensions and the total scale score. An important result to mention is the relationship between the WBI-PA and the total score which has been identified as significantly weak and positive ($r = .17; p = 0.05$).

Regression analyses

Hypothesis 1_d was anticipated to identify how much of the variance in physical activity can be explained by both independent variables and furthermore which variable is most important in the relationship with physical activity. Since univariate correlations including the IPAQ have not displayed significant relationships, the conducted regression analyses merely included the single item on the WBI as a measure of physical activity.

The multiple regression analysis (Table 4) unveiled that the positive dimension of self-compassion and self-coldness did not significantly predict physical activity $F_{(1,132)} = 2.16, p = .120, R^2 = .03$. Moreover, the variable of the positive dimension, that is self-compassion did not significantly predict physical activity levels $\beta = .05, t_{(133)} = .49, p = .627$. Furthermore, the analysis disclosed that the relative contribution of self-coldness did not predict physical activity $\beta = .15, t_{(133)} = -1.6, p = .121$.

Table 4

Multiple Regression Analysis of Self-Compassion, Self-Coldness and Physical Activity (WBI-PA).

<i>Model</i>	<i>Unstandardized Coefficients</i>		<i>Standardized Coefficients</i>			<i>Model Statistics</i>			
	<i>B</i>	<i>Std. Error</i>	<i>Beta</i>	<i>T</i>	<i>Sig.</i>	<i>F</i>	<i>p</i>	<i>R</i>	<i>R²</i>
1 (Constant)	3.49	.34		10.30	.000	2.16	.12	.18	.03
Self-compassion	.14	.09	.05	.49	.627				
Self-coldness	.05	.10	.15	-1.6	.121				

Interestingly, the multiple regression showed that self-coldness did not significantly predict physical activity levels despite the fact that univariate correlations were able to establish a relationship between two constructs. Therefore, we assumed that the combined model of self-compassion and self-coldness was not a good fit. To support this claim, we conducted a simple linear regression to identify how much of the variance of physical activity can be attributed to self-coldness (Table 5)

The analysis unveiled a significant proportion of variance in physical activity $F_{(1,132)} = 4.10, p < 0.05, R^2 = .03$. Self-coldness was able to significantly predict physical activity levels $\beta = -.17, t_{(133)} = -2.03, p < 0.05$. Thus, 3% of an individual’s physical activity level can be attributed to one’s self-coldness.

Table 5

Simple Linear Regression Analysis of Self-Coldness and Physical Activity (WBI-PA).

<i>Model</i>	<i>Unstandardized Coefficients</i>		<i>Standardized Coefficients</i>			<i>Model Statistics</i>			
	<i>B</i>	<i>Std. Error</i>	<i>Beta</i>	<i>T</i>	<i>Sig.</i>	<i>F</i>	<i>p</i>	<i>R</i>	<i>R²</i>
1 (Constant)	4.54	.22		20.76	.000	4.10	.045	.17	.03
Self-coldness	-.03	.01	-.17	-2.03	.045				

To summarize, hypothesis 1_d predicted that self-compassion would be stronger related to physical activity levels. However, the combined model of self-compassion and self-coldness seemed to not be a good fit which caused inconclusive results. The posterior administered linear regression analysis revealed that 3% of an individual’s levels of physical activity could be attributed to their their self-coldness. In other words, this implies that 3% of an individual’s reduced engagement in physical activity can be attributed to higher levels of self-coldness and vice versa. Since self-coldness is thus stronger related to physical activity, the hypothesis could not be supported and is consequently rejected.

Discussion

Self-compassion and self-coldness have shown to be significantly related. As expected, the relationship is moderate and negative. Participants who scored high on self-compassion, scored low on self-coldness and vice versa. This indicates that the two dimensions of the Self-Compassion Scale are distinct and are thus relating differently to diverse concepts. This is in line with previous literature. According to López et al. (2015), the positive dimension self-compassion is stronger related to positive affect, while the negative dimension self-coldness is moderately to strongly related to depressive symptoms and perceived stress. These findings suggest that we should rethink the use of the SCS as an overall indicator for levels of self-compassion. Instead we should make a differentiation between self-compassion and self-coldness.

The negative dimension self-coldness has been determined to be stronger related to physical activity. Since previous research has established a relationship between self-compassion and physical activity (Biber & Ellis, 2017; Dunne, Sheffield & Chilcot, 2018; Sirois, Kitner & Hirsch, 2015), it was expected that this relationship is stronger. The discrepancy between the expectations and actual results might be connected to an underestimation of the self-coldness dimension and their capability to influence levels of physical activity. On the one hand, research suggests that self-coldness is strongly related to distress (Brenner et al., 2018) and depressive symptoms (López, Sanderman & Schroevers, 2018). On the other hand, studies have determined that higher levels of depressive symptoms are related to lower physical activity levels (Alosco et al., 2012). Therefore, we assume that the established negative relationship between self-coldness and physical activity might have had sufficient grounds to justify them, nonetheless, we underestimated the power of negative feelings. Even though only 3% of the variance in physical activity could be explained by self-coldness, these findings suggest that future research should also aim at decreasing levels of self-coldness. We assume that an individual's levels of physical activity would automatically rise if their level of self-coldness would be reduced. Since previous interventions seemed to be inefficient, interventions including self-coldness could aid in enhancing levels of physical activity. This certainly does not imply that high levels of self-coldness are exclusively responsible for low levels of physical activity, however it is a factor which should be considered.

The positive dimension, that is self-compassion, displayed no significant relationship with physical activity. This result seems to oppose discoveries of previous research. For example, according to Mosewich et al. (2011), self-compassion could be handled as a resource for professional sports. Possible explanations for the discrepancy may include the different measurement instruments of self-compassion. While the preceding literature included the total score of the SCS, this current research merely used the positive dimension of the SCS. Therefore, this finding presents repeating evidence concerning the differentiation of the Self-Compassion Scale. Not only do the negative and positive dimension relate distinctly, but also the total score of the SCS seems to measure an entirely different construct. Future research is needed to identify which of the two proposed dimensions, that is the total score of the SCS or the positive dimension self-compassion is able to explain the concept self-compassion best in order to propose further successful interventions in which self-compassion might be used as a variable.

Self-coldness was found to be weak and negatively correlated with physical activity. This implies that people who scored high on self-coldness, engaged in lower levels of physical activity and vice versa. These findings are in line with our aforementioned expectations. Since previous research has established relationships of self-coldness with distress (Brenner et al., 2018), negative affect and depressive symptoms (López et al., 2015), it was assumed and consequently supported that self-coldness would act as reducing factor in the engagement of physical activity. The results not only strengthen the aforementioned recommendation to consider self-compassion and self-coldness distinctively, but further provide evidence that self-coldness might be recognized as an inhibitor in the relationship with physical activity.

A surprising finding of the current study comprised the differential results with regard to the physical activity instruments. While the IPAQ has found no significant relationship with either variable, the WBI-PA was able to establish relationships with self-coldness and the total score of the SCS. The non-significant findings of the IPAQ might be attributable to the fact that it measures an individual's physical activity level over the last 7 days and thus, is not measuring a constant and stable level of physical activity. Moreover, it demanded exact and accurate statements regarding the time participants engage in physical activity, which participants might have filled out by taking rough estimations. Homan and Sirois (2017) for example used the Health Promoting Lifestyle Profile II by Walker, Sechrist and Pender (1995) which includes an 8-item subscale on physical activity, to determine how self-compassion is related to physical health. Another research

included the 12-item Commitment to Physical Activity Scale by Corbin, Nielsen, Bordsdorf and Laurie (1987) (Gilbertson, 2016). Hence, previous literature demonstrated a variety of other possible measures which could have been used. In conclusion, future research should focus on measures of physical activity which provide a more consistent and thorough analysis of participants level of physical activity.

Another striking finding included that no significant correlation could be found between the positive dimension of self-compassion and physical activity, however the total score of the SCS has been shown to be significantly weak and positive associated with physical activity. Both measures are acclaimed to measure the concept of self-compassion. A possible explanation for the differential results might include the divergent definitions of self-compassion. According to Neff, the total score of the SCS is supposed to measure self-compassion as a balanced approach between the negative and positive dimension. As this study proposed to divide the two concepts as proposed by López, the positive dimension of self-compassion includes solely positive formulated items. Therefore, it seems that in this study the term self-compassion measured two different constructs. Future research is needed to establish a consistent understanding of what exactly self-compassion entails, that is whether it is merely consisting of the positive position or the balanced approach of negative and positive dimension.

Strengths and Limitations

The current research contains strengths as well as limitations which will be further discussed in the following paragraphs. To begin with, the present study provides several contributions to the engagement in physical activity literature. As discussed in the introduction, there is a need of expanding the number of people who are engaging in sufficient physical activity not only in Europe, but worldwide. Considering the multitude of interventions which failed to succeed, there is an enormous need for an alternative solution. Thus, the topic chosen for this research was applicable to today's societal needs and was aimed at finding possibilities to aid adherence in the health promoting behavior physical activity. The topic itself is applicable to every human being and thus of tremendous importance not only for the immediate benefits physical activity presents, but also the increasement of lifetime expectancy when adhering to or maximizing the physical activity behavior. Additionally, it should be recognized that the results indicated proof to separate the two dimensions, self-compassion and self-coldness respectively. Thus, this study might give

an impulse to test before considered concepts again as well as conducting future research with a two-dimensional scale as proposed by López et al. (2015). A further strength comprised the number of participants which was still high, even though a large group had to be excluded from the sample due to various aforementioned reasons. Lastly, since this was a quantitative research, the results are relatively easy to analyze and findings can be generalized to some degree since the sample was distributed normally in terms of age, occupational status and the highest degree earned.

However, the study also displays limitations which should be taken into consideration when interpreting the results or when considering future research in the particular field. Firstly, the distribution of physical activity levels displayed that the studied population was rather highly physically active. This distribution might have had an influence on the results. Moreover, as already mentioned above, one of the measures of physical activity, the IPAQ, is solely gathering data of the last 7 days and thus, does not give an overview of a stable and enduring physical activity level of participants. Further, the IPAQ was not able to provide any significant results and thus, might have been an inaccurate choice of measurement, especially with regards to how different the results of the WBI-PA depicted to be.

Conclusion

The aim of the current study was to explore the relationship between self-compassion, self-coldness and physical activity. Results repeatedly provided evidence concerning the distinct treatment of the positive and negative dimension of the Self-Compassion Scale. Moreover, the term self-compassion has been shown to have differential definitions across the divergent use of the measurement instrument. Results significantly displayed that higher levels of self-coldness are related to lower engagement in physical activity. Since no significant relationship between self-compassion and physical activity could be established, it can be concluded that self-coldness is stronger related to physical activity. This study provides new insights into the treatment of self-compassion with physical activity and proposes self-coldness as possible key factor to enhance adherence to physical activity levels.

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Appendices

Appendix A

Invitation letter

Welcome!

You are being invited to participate in a research study about self-compassion and health behaviors. This study is being conducted by Marlene Dahm, Sophia Bauhuf, Hannah Honsel and Maja Kalkofen from the Faculty of Behavioural, Management and Social Sciences at the University of Twente.

Self-compassion has been the focus of much research conducted over the last years. It can briefly be described as the skill to encounter difficult situations or failure with understanding and kindness for oneself. The purpose of this research study is to gain more insights into the relationship between self-compassion, physical health and health behaviors and it will take you approximately 20 minutes to complete. The data will be stored anonymously and will be used for research purposes only by the aforementioned researchers, as well as the supervising staff of Dr. C.H.C. Drossaert and Dr. N. Köhle.

Your participation in this study is entirely voluntary and you can withdraw at any time. You are free to omit any questions by contacting any of the below provided e-mail addresses.

We believe there are no known risks associated with this research study; however, as with any online related activity the risk of a breach is always possible. We hereby assure that your answers in this study will remain confidential.

Thank you for your participation,

Maja Kalkofen (m.kalkofen@student.utwente.nl)

Sophia Bauhuf (s.bauhuf@student.utwente.nl)

Hannah Honsel (h.honsel@student.utwente.nl)

Marlene Dahm (a.m.dahm@student.utwente.nl)

Appendix B

Informed Consent

Self-compassion has been the focus of much research conducted over the last years. It can briefly be described as the skill to encounter difficult situations or failure with understanding and kindness for oneself. This current study focuses on the connection of self-compassion with physical health and different health behaviors. Your answers on this questionnaire will be stored anonymously on a secured server of the University of Twente and will be used for analysis and/or scientific publications/presentations.

It is important to mention that you cannot give any wrong answers. The researchers are interested in how you experience the concept of self-compassion and its connection to various health behaviors. Therefore, we encourage you to answer the questions truthfully.

- ‘I hereby declare that I have been informed in a manner which is clear to me about the nature and method of the research as described in the introduction.
- My questions , if any, have been answered to my satisfaction.
- I agree of my own free will to participate in this research.
- I reserve the right to withdraw this consent without the need to give any reason and I am aware that I may withdraw from the research at any time.
- I know that if the results of this study are to be used in scientific publications or made public in any other manner, then they will be made completely anonymous and my information will be kept confidential.
- If I request further information about the research, now or in the future, I may contact Maja Kalkofen (m.kalkofen@student.utwente.nl)’

By clicking the ‘next’ button, you agree to the conditions.

Appendix C

Self-compassion Scale (SDS-SF; Neff; 2003)

1

2

3

4

5

- _____ 1. When I fail at something important to me I become consumed by feelings of inadequacy.
- _____ 2. I try to be understanding and patient towards those aspects of my personality I don't like.
- _____ 3. When something painful happens I try to take a balanced view of the situation.
- _____ 4. When I'm feeling down, I tend to feel like most other people are probably happier than I am.
- _____ 5. I try to see my failings as part of the human condition.
- _____ 6. When I'm going through a very hard time, I give myself the caring and tenderness I need.
- _____ 7. When something upsets me I try to keep my emotions in balance.
- _____ 8. When I fail at something that's important to me, I tend to feel alone in my failure
- _____ 9. When I'm feeling down I tend to obsess and fixate on everything that's wrong.
- _____ 10. When I feel inadequate in some way, I try to remind myself that feelings of inadequacy are shared by most people.
- _____ 11. I'm disapproving and judgmental about my own flaws and inadequacies.
- _____ 12. I'm intolerant and impatient towards those aspects of my personality I don't like.

Appendix D

International Physical Activity Questionnaire

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The following questions will ask you about the time you spent being physically active in the **last 7 days**. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?

days per week

no vigorous physical activities

How much time did you usually spend doing **vigorous** physical activities on one of those days?

hours per day

minutes per day

don't know/not sure

Think about all the **moderate** activities that you did in the **last 7 days**. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

days per week

no moderate physical activities

How much time did you usually spend doing **moderate** physical activities on one of those days?

hours per day

minutes per day

don't know/not sure

Think about the time you spent **walking** in the **last 7 days**. This includes at work and at home, walking to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise, or leisure.

During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time?

days per week

no moderate physical activities

How much time did you usually spend **walking** on one of those days?

hours per day

minutes per day

don't know/not sure

Appendix E

Wellness Health Inventory (WBI; Sirois, 2001; 2019)

We would like to get some insight in your various health behaviours. The following questions are concerned with different habits and your daily life. Please read each statement carefully before answering. Please indicate how each statement is applicable to your situation.

Almost never

Almost always

1

2

3

4

5

5. I do physical activity every day (30 min or more).

Appendix F

MET Values and Formula for Computation of MET minutes/week

All types of walking were included and an average MET value for walking was created. The same procedure was undertaken for moderate-intensity activities and vigorous-intensity activities. The following values continue to be used for the analysis of IPAQ data: Walking = 3.3 METs, Moderate PA = 4.0 METs and Vigorous PA = 8.0 METs. Using these values, four continuous scores are defined:

Walking MET-minutes/week = 3.3 * walking minutes * walking days

Moderate MET-minutes/week = 4.0 * moderate-intensity activity minutes * moderate days

Vigorous MET-minutes/week = 8.0 * vigorous-intensity activity minutes * vigorous days

Total Physical Activity MET-minutes/week = sum of Walking + Moderate + Vigorous MET-minutes/week scores