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Present and future time perspectives and health behavior

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Abstract

Background and purpose

Lifestyle diseases are the leading cause of life-time disability and death in modern society. Knowledge of the underlying causes and mechanisms of health behavior choices is crucially important when developing health-promoting campaigns and planning health behavior interventions.

This dissertation aimed to advance our understanding of the relationship between time perspective (TP) and health behavior. The six major objectives were:

- to establish the discriminant validity between the present and future dimensions of the two most frequently used operationalizations of TP: the Consideration of Future Consequences Scale (CFCS) and Zimbardo Time Perspective Inventory (ZTPI), as well as to compare their relationships with health behavior.
- to establish the discriminant validity between the consideration of immediate and future consequences (CFC-I and CFC-F), and to test whether they differentially predict healthy and unhealthy behaviors.
- to explore CFCS-based, ZTPI-present/future based, and a combined CFCS and ZTPI-present/future based temporal profiles of the Norwegian population.
- to test whether the domain-specific CFC-health would be more strongly related to health behaviors than the general CFC.
- to study the direct effect of perceived connectedness to the future self on health behavior, as well as its moderating effect on the relationship between CFCS and health behaviors.

— to test the moderating effect of age on the relationship between TP and smoking behavior.

Design/methodology/approach

This dissertation utilized a quantitative survey design and a survey experiment. The data are analyzed with t-tests, confirmatory factor analyses, structural equation modeling (SEM), and cluster analyses.

Results

Paper 1 established the discriminant validity of the present and future time perspective constructs of CFCS and ZTPI, as well as the discriminant validity of the present and future constructs of both scales. The present TP – but not future TP – of both scales was related to smoking. The ZTPI model had stronger predictive power than the CFCS model.

Paper 2 revealed present and future temporal profiles in the general Norwegian population. CFCS-based profiles were more predictive of health behaviors than ZTPI-based profiles. However, the profiles based on the combination of both CFCS and ZTPI variables were more predictive of smoking, exercising, and health intentions.

Paper 3 established the discriminant validity between CFC-I and CFC-F that differentially predicted health behaviors. CFC-I was associated with unhealthy behaviors, whereas CFC-F was associated with healthy behaviors. PCFS had a direct negative effect on healthy behaviors, strengthened the positive effect of CFC-I and weakened the negative effect of CFC-F on unhealthy behaviors.

Paper 4 established in a randomized experimental design that a domain-specific CFC–

health was a better predictor of self-reported eating and exercising behaviors than a general CFC. Moreover, the discriminant validity between health-specific CFC-I and CFC-F was established. Health-specific CFC-F was a stronger predictor of exercise behavior than CFC-I.

Conclusions and practical implications.

The results of the study indicate that the present and the future TPs are related but distinct constructs that differentially predict healthy and unhealthy behaviors. The relationship between CFC and health behavior is likely influenced by regulatory focus. In western societies, where the promotion regulatory orientation dominates, individuals are more likely to be motivated by approach goals rather than avoidance goals. The findings suggest that future orientation was associated with healthy behaviors, but not with unhealthy behaviors. At the same time, present-oriented people were more engaged in unhealthy behaviors, but were not less engaged in healthy behaviors. The findings suggest that emphasizing the future health benefits of healthy choices and reducing the immediate attractiveness of unhealthy choices might be more effective in the Norwegian population.

Another finding was that CFCS-based population profiles were more predictive of health behaviors than ZTPI-based profiles; however, the profiles based on a combination of CFCS and ZTPI differed in their health behaviors the most. These findings could be helpful when choosing the basis on which to segment the population during health intervention programs.

We demonstrated that a domain-specific CFC-health was more effective at predicting health behaviors than a general CFC. The usage of CFC-health in future studies might increase effect sizes and the overall predictive power of the models and, thus, decrease the ambiguity of the findings.

Finally, we showed that lack of connection with the future self influenced health behaviors both directly and indirectly. This finding emphasizes the importance of the programs aiming to increase individual connectedness to the future self.

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Present and future time perspectives and health behavior.

Part I. Introduction.

1.1. Background and purpose.

Western society is plagued by an epidemic of chronic diseases, and the rest of the world is catching on (Yach, Hawkes, Gould, & Hofman, 2004). Diabetes, cardio-vascular diseases, cancer and obesity are the leading causes of life-time disability and death (Wilkins et al., 2017). Many of these conditions are predominantly lifestyle diseases, which means that their root is poor health choices, such as highly processed, high sugar and fat diets, combined with low fruit and vegetable consumption and low levels of physical activity (Aune et al., 2017; Stampfer, Hu, Manson, Rimm, & Willett, 2000). Making things worse, children are beginning to suffer from the same effects of the unhealthy lifestyle as adults (García-Hermoso, Ramírez-Vélez, & Saavedra, 2019).

Educational, health promotion, and health behavior intervention campaigns are needed to influence the public's risk awareness and beliefs about the consequences of their health behavior choices. However, while some people accept new health messages and manage to make and sustain health behavior changes, others fail to adhere to recommendations and/or implement lasting changes in their lives. The factors influencing the ability to implement and sustain a health behavior change can be divided into two categories: individual and environmental (Hillard, Riekert, Ockene, & Pbert, 2018). This work focuses on health behavior as a personal choice, and the individual factors will be discussed later.

Environmental factors can either facilitate or impede health behavior change (Koplan & Dietz, 1999). Such factors can be, for example, social support (DiMatteo, 2004; Yang, 2013),

availability and affordability of healthier alternatives in home, school and work environments (Boone-Heinonen et al., 2011; Campbell et al., 2014; Carroll-Scott et al., 2013; Morland, Wing, Diez Roux, & Poole, 2002; Singleton, Affuso, & Sen, 2016), and family norms, peer pressure and cultural traditions (Diez Roux, 2011). Individuals can often be unaware of environmental influences on their health behavior (Wansink & Sobal, 2007). Thus, to be able to initiate a lasting change in health behavior, intervention campaigns should consider social and political contexts (Brownell, 2010; McKinlay & Marceau, 2000).

On an individual level, message effectiveness can be influenced by such factors as personal relevance (Liberman & Chaiken, 1992); self-affirmation (Sherman, Nelson, & Steele, 2000); language (Miller, Lane, Deatrick, Young, & Potts, 2007); health literacy and educational strategies (Negarandeh, Mahmoodi, Noktehdan, Heshmat, & Shakibazadeh 2013); message framing and health behavior type (Rothman, Martino, Bedell, Detweiler, & Salovey, 1999); and health consciousness and socioeconomic status (Iversen & Kraft, 2006). Additionally, earlier research has shown that health communication effectiveness can be increased if individual psychological differences and beliefs of the recipients are taken into account (Bull, Kreuter, & Scharff, 1999), for example, self-efficacy (Riet, Ruiter, Werrij, & De Vries, 2008); regulatory focus (Keller, 2006; Shen & Dillard, 2007; Uskul, Sherman, & Fitzgibbon, 2009); information-processing styles (Williams-Piehota, Schneider, Pizarro, Mowad, & Salovey, 2003); locus of control (Williams-Piehota, Schneider, Pizarro, Mowad, & Salovey, 2004); and ambivalence (Broemer, 2002). Thus, understanding underlying individual psychological differences is crucial in the development of health communication and other health intervention strategies. Earlier research has established the association of individual differences in health behavior with conscientiousness and agreeableness (Booth-Kewley & Vickers, 1994); self-efficacy (Schwarzer,

2008); self-control (de Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012; Tangney, Baumeister, & Boone, 2004); sensation seeking (Roberti, 2004); impulsivity and temporal discounting (Granö, Virtanen, Vahtera, Elovainio, & Kivimäki, 2004; Sheffer et al., 2014); risk perception (Brewer et al., 2007); and time perspective (Adams, 2012; Keough, Zimbardo, & Boyd, 1999).

The present work focuses on the connection between individual difference in time perspective (TP) and health behavior. The health behavior choice is embedded in the temporal context because, for the most part, the health consequences of such behaviors do not occur immediately, but in a distant future. Most health behaviors have two types of outcomes: short-term and long-term. Short-term benefits of unhealthy behaviors are spared time, convenience, taste, and alleviation of cravings caused by addictions. However, unhealthy behaviors can also have short-term costs like, for example, feelings of remorse and regret. The long-term costs of giving into the immediate temptations are pour health, obesity, decreased quality of life, and a shortened lifespan. By contrast, healthy behaviors convey immediate costs in terms of invested time, physical effort, and foregone short-term pleasures. Healthy behaviors can also have immediate benefits such as improved self-image, positive emotions, and social interaction (Brown, 2005). The long-term benefits of healthy behaviors are better health and increased quality of life in later years. If we were to take time out of the equation, that is, if health consequences of a behavior were to occur immediately after performing that behavior, they would be worth much more than the immediate benefits or costs of performing that behavior. However, health consequences occur over time, and are often not the result of a single unhealthy behavior, but of a chain of repeated behaviors over a longer period of time. Moreover, it is not certain that health consequences would occur in the future but rather that there is a risk or a

chance of it happening. Thus, some people choose to sacrifice their future health in exchange for the short-term pleasures of unhealthy behaviors.

Time perspective "represents an individual's cognitive way of relating to the psychological concepts of the past, present and future, which affects decision making and subsequent actions" (Boniwell, Osin, Alex Linley, & Ivanchenko, 2010, p. 24). Time perspective is a multi-faceted concept that reflects cognitive involvement, affection, and behavior towards the past, present, and future (Shipp, Edwards, & Lambert, 2009). Although there exist multiple measures of time perspective, the most frequently used are Zimbardo Time Perspective Inventory (ZTPI) (Zimbardo & Boyd, 1999) and the Consideration of Future Consequences Scale (CFCS) (Joireman, Shaffer, Balliet, & Strathman, 2012). While the CFC construct representing the consideration of present and future consequences of one's behavior mostly reflects behavior towards the present and future, ZTPI is a mix of cognition, affect and behavior towards the past, present, and future (Shipp et al., 2009). Thus, these constructs – though overlapping – are distinct from each other (Crockett, Weinman, Hankins, & Marteau, 2009; Daugherty & Brase, 2010; McKay, Perry, Cole, & Worrell, 2018). *The first objective* of this work was to answer the call for studying similarities and differences between CFCS and ZTPI's future and present dimensions by Joireman and King (2016) and to compare ZTPI and CFCS, as well as their influence on health behavior (Papers 1 and 2).

Since health behavior choice is a choice between short-term and long-term consequences of one's actions, we – as most researchers of health behavior (Fieulaine & Martinez, 2010) – concentrate on the present and future dimensions of time perspective. The past is an important predictor of health behavior, but the past dimension is strongly connected with personal emotions about past experiences (Matthews & Stolarski, 2015). As we compare CFCS and ZTPI, and

CFCS does not include emotions, we chose to adopt a conscious cognitive approach to TP and health behavior and leave the emotional aspect of time perspective outside the scope of this work.

The CFCS was first developed by Strathman, Gleicher, Boninger, Edwards, and Geen (1994) as a unidimensional construct. There has been scientific debate on whether consideration of immediate (CFC-I) and future (CFC-F) consequences are the extremities of the same scale or two separate dimensions (Adams, 2012; Dassen, Houben, & Jansen, 2015; Hevey et al., 2010; Joireman, Balliet, Sprott, Spangenberg, & Schultz, 2008; McKay, Cole, & Percy, 2015; Petrocelli, 2003; Rappange, Brouwer, & Van Exel, 2009; Toepoel, 2010). Thus, *the second objective* of this work was to test whether CFC-I and CFC-F are different constructs (Papers 1, 3, 4) and whether they have different relationships with healthy and unhealthy behaviors (Paper 3).

If time perspective is a multidimensional concept, then individuals can have unique scores on all the dimensions, and thus, we can distinguish the segments or clusters of individuals who have a similar scoring pattern. Zimbardo and Boyd (1999) suggested an idea of a balanced time perspective, which was supposed to be the most functional. Since then, several works have investigated this issue using cluster analysis (Boniwell et al., 2010; Cole, Andretta, & McKay, 2016; McKay, Andretta, Magee, & Worrell, 2014; Worrell, McKay, & Andretta, 2015). Cluster analysis is a person-oriented approach and is an alternative to a more common variable-oriented approach. A universal temporal profile solution for all cultural settings has not yet been identified (Boniwell et al., 2010; Cole et al., 2016). Thus, *the third objective* of this work was to explore the temporal profiles in the Norwegian population (Paper 2). The novelty of the present work is that we tested CFCS-based, ZTPI-present/future based, and combined CFCS and ZTPI-

present/future based profiles, while previous research has only identified the profiles based on ZTPI.

It is universally acknowledged that behavior-specific individual differences constructs predict behaviors better than general constructs, and the same holds true in the domain of health (van Beek, Antonides, & Handgraaf, 2013). However, such constructs are very specific, and might not predict other behaviors in the same domain (van Beek et al., 2013). Thus, in situations that involve assessing and predicting several health behaviors, it might be resource-consuming to use behavior-specific measures. Hence, *the fourth objective* of the present work was to test whether a more general domain-specific CFC-health would predict various health behaviors significantly better than a general CFC (Paper 4).

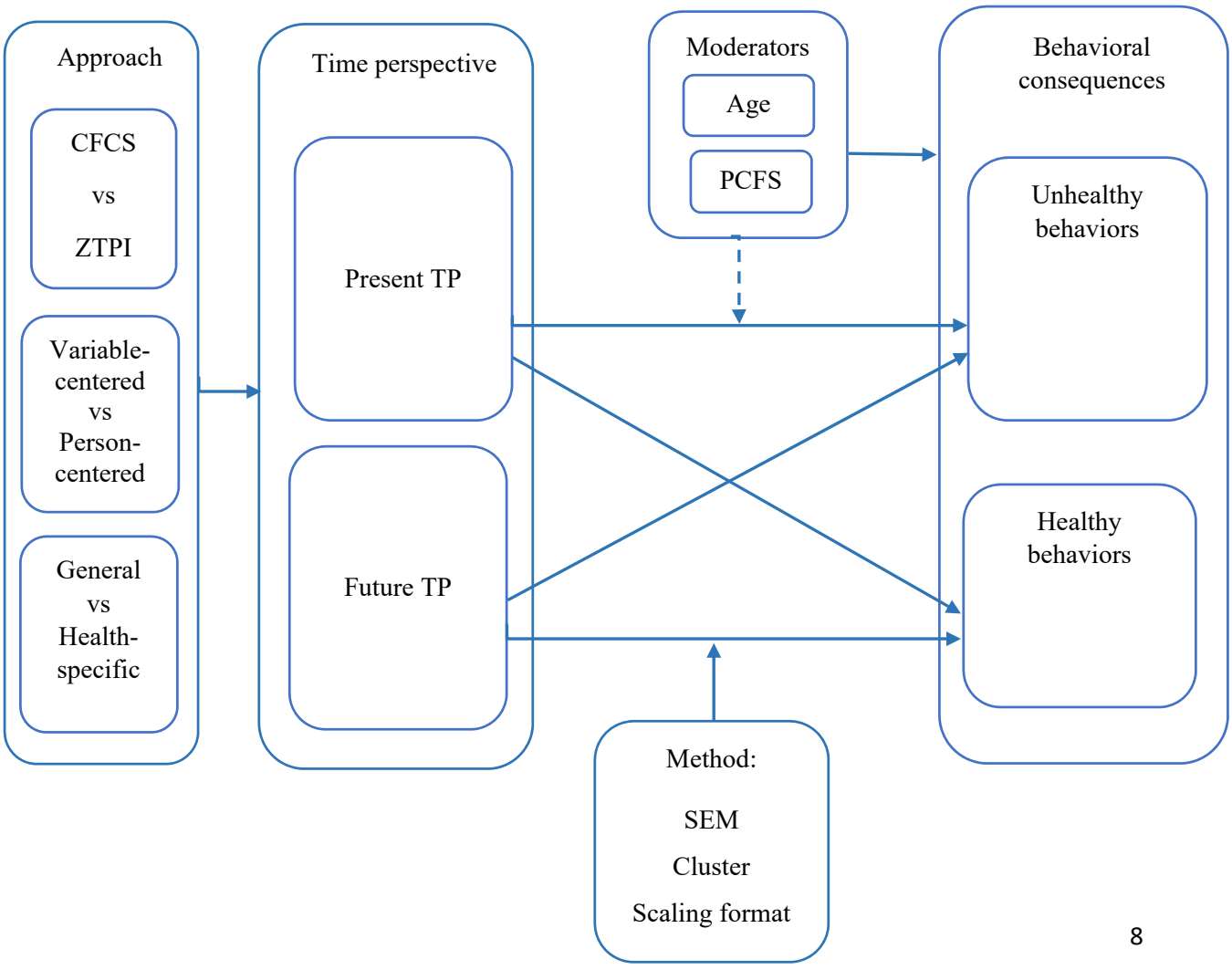
The antecedents of time perspective is an important research question (Kooij, Kanfer, Betts, & Rudolph, 2018), however, this issue is mostly outside the scope of the present work. This dissertation includes connectedness to the future self and age, but only tests their moderating effect on the relationship between time perspective and health behaviors. The construct of the perceived connectedness to the future self or future self-continuity reflects the degree to which a person perceives his/her future self as him/herself. If the person were to perceive themselves as a total stranger, they would be less likely to sacrifice immediate happiness in order to obtain goals for the benefit of that unknown self in the future. Perceived connectedness to the future self was shown to influence intertemporal choice and financial decisions, such as retirement savings (Ersner-Hershfield, 2011). However, its influence on health behavior has not been sufficiently studied. Thus, *the fifth objective* of this work was to study the main effect of perceived self-continuity on health behavior and its moderating effect on the relationship between CFCS and health behaviors (Paper 3).

The perception of time changes with age (Löckenhoff, 2011). Time perspective is assumed to be a stable construct (Zimbardo & Boyd, 1999), and while individual works have not found a direct association between age and ZTPI (Simons, Peeters, Janssens, Lataster, & Jacobs, 2018), the meta-analysis conducted by Laureiro-Martinez, Trujillo, and Unda (2017) showed a significant negative relationship between Zimbardo present hedonistic and age. Guthrie, Butler, Lessl, Ochi, and Ward (2014) found a moderating effect of age on the relationship between ZTP and various health behaviors. The authors suggested that TP might only be influencing health behavior at the stage of behavioral onset, when individuals undergo active decision making. Thus, *the sixth objective* of our work was to check whether age would moderate the relationship between time perspective and smoking behavior (Paper 1). The moderation effect was tested for the model with ZTPI and CFCS.

1.2. Theoretical framework

This chapter presents the theoretical framework of this dissertation. On a general level, this work investigates the relationship between **TP** and health behavior. **TP** is divided into the present and future **TP**, whereas health behavior is divided into unhealthy and healthy behaviors. **TP** is represented by two constructs: **CFC** and **ZPTI**. The relationships between **TP** and health behaviors are investigated with the help of variable- and person-oriented approaches. Furthermore, the moderating effect of **PCFS** and age is tested. Next, it is tested whether a domain-specific **CFC-health** is a better predictor of health behaviors than a **general CFC**. Figure 1 summarizes the theoretical framework of this dissertation.

Figure 1: Theoretical framework.



1.2.1. Time perspective/ temporal orientation and health behavior

The terms "time perspective" and "temporal orientation" are often used interchangeably (Lasane & O'Donnell, 2005). However, time perspective is a broader term than temporal orientation. Time perspective characterizes "the way an individual projects, collects, accesses, values, and organizes events that reside indistinct temporal loci", that is, the past, present, and future (Lasane & O'Donnell, 2005, p. 12). TP can be accessed on multiple dimensions. Some of these dimensions are: extension, that is, mental distance in the past or future (e.g., temporal depth index by Bluedorn, 2002); density, that is, allocation of attention (e.g., temporal focus by Shipp et al., 2009); valence, that is, emotion (e.g., adolescent time attitude scale by Worrell, Mello, & Buhl, 2013); accessibility, that is, the ability to recall and use information; content, that is, information; and structural organization, that is, linkages between the past, present, and future (Lasane & O'Donnell, 2005).

Temporal orientation "involves a behavioral predisposition to be more likely influenced by thoughts, emotions, and motivations for a distinct region of time…time orientation is the behavioral by-product of the cognitive processes that results in a distinct pattern of responding to objects, events, and situations that implicate a particular temporal space" (Lasane & O'Donnell, 2005, p. 14).

Although TP incorporates the past, present, and future dimensions, it is most common to use the present and future dimensions when we speak about intertemporal choice. Intertemporal choice is a choice between a "smaller sooner" and a "larger later" cost and reward (Rick & Loewenstein, 2008). Health behavior often implies intertemporal choice, as it means sacrificing smaller immediate pleasures for greater health benefits in the distant future. Thus, most health-related literature uses present and future time perspectives to explain health behavior (Fieulaine & Martinez, 2010).

Health behavior is defined as: "… overt behavioral patterns, actions and habits that relate to health maintenance, to health restoration and to health improvement" (Gochman, 1997, p. 3 cited in Conner & Norman, 2017). In other words, health behavior is behavior that has an impact on health. The four most commonly assessed health behaviors are smoking, drinking, exercising and diet (Conner & Norman, 2017).

Joireman et al. (2012) suggested that the relationships between CFC and health behavior are mediated by regulatory focus (Higgins & Hoffman, 1987; Higgins, Roney, Crowe, Hymes, & Tesser, 1994), that is, by approach or avoidance strategies. In this light, we can look at four potential scenarios: two present-oriented and two future-oriented. The first scenario is the present-oriented approach strategy, aiming to achieve small immediate goals that might damage future health, for instance, eating tasty but unhealthy foods or satisfying the urge to smoke. The second scenario is the present-oriented avoidance strategy, avoiding short-term inconveniencies and costs of healthy behaviors at the expense of future health, for instance avoiding exercising or eating healthy foods that can be perceived as not tasty or inconvenient. The third scenario is the future-oriented approach strategy, aiming to achieve good health results in the future by engaging in healthy behaviors in the present moment, for instance, exercising and eating healthy foods. The fourth scenario is the future-oriented avoidance strategy, that is, avoiding unhealthy behaviors that could harm an individual's health in the future, including, for instance, avoiding smoking, drinking alcohol, risky driving, and unhealthy food. Hence, distinguishing between healthy and unhealthy behaviors is justified by possible different underlying psychological mechanisms.

In this thesis healthy behaviors are represented by healthy eating and physical activity, whereas unhealthy behaviors are represented by unhealthy eating and smoking. Not smoking,

good dietary practice, and adequate physical activity are among factors influencing chronical conditions and life expectancy (Ford, Bergmann, Boeing, Li, & Capewell, 2012). In this thesis physical activity was represented by walking and exercising. In an exploratory factor analysis, they loaded one factor. In a literature review Paquette (2005) showed that eating fruit and vegetables was consistently recognized as healthy eating. In a study by Povey, Conner, Sparks, James, and Shepherd (1998) eating plenty of fruit and vegetables was considered the most important component of a healthy diet, while food with high content of fat, sugar, fried food and fast food was characterized as unhealthy. The authors conclude that, in general, people's perception of healthy and unhealthy eating corresponds with dietary guidelines. In an exploratory factor analysis, eating cakes, unhealthy (sweet/salty) snacks, and drinking beverages with high sugar content loaded one factor, whereas eating fruit and vegetables loaded another factor.

1.2.2. Present and future time perspectives and health behavior.

Present time perspective refers to: "a primary orientation to the here-and-now, and an inclination to form goals and adopt behaviors that meet immediate desires" (Henson, Carey, Carey, & Maisto, 2006, p. 127). People with present time perspective prioritize short-term interests. Present time perspective is associated with risky behaviors (Rothspan & Read, 1996; Zimbardo, Keough, & Boyd, 1997); lower academic achievement (Adelabu, 2007); compulsive buying tendencies and credit card debt (Joireman, Kees, & Sprott, 2010). In the context of health behavior, present-oriented people are expected to pursue the immediate pleasures of unhealthy behaviors, and to avoid the immediate costs of healthy behaviors.

In this dissertation, present time perspective is represented by consideration of immediate consequences (CFC-I), Zimbardo present hedonistic (ZPH), and Zimbardo present fatalistic (ZPF) constructs. CFC-I reflects the degree to which individuals consider the immediate

consequences when choosing their actions (Joireman et al., 2012). Present hedonistic reflects an immediate, risk-taking, pleasure-seeking attitude to life. Present fatalistic reflects a pessimistic view on life, in which individuals believe that fate or other external forces control the future (Zimbardo & Boyd, 1999). CFC-I has been associated with self-control (Joireman et al., 2008); smoking status and BMI-index (Adams, 2012); and environmental concern and motivation (Arnocky, Milfont, & Nicol, 2014). Zimbardo present time perspective has been associated with risky driving (Zimbardo, Keough, & Boyd, 1997) and substance use (Keough et al., 1999).

Thus, the hypotheses in this work were:

H1: Present TP is positively related to unhealthy behaviors.

H1a1: CFC-I is positively related to smoking.

H1a2: CFC-I is positively related to unhealthy eating.

H1b1: ZPH is positively related to smoking.

H1b2: ZPF is positively related to smoking.

H2: Present TP is negatively related to healthy behaviors.

H2a1: CFC-I is negatively related to physical activity.

H2a2: CFC-I is negatively related to healthy eating.

Future time perspective can be defined as: "a relatively general tendency to be concerned with future events" (Kastenbaum, 1961, p. 217). It is positively associated with delay of gratification (Bembenutty & Karabenick, 2004); pro-environmental behaviors (Joireman, Lasane, Bennett, Richards, & Solaimani, 2001; Milfont, Wilson, & Diniz, 2012); better school performance (Peters, Joireman, & Ridgway, 2005); and health-protective behaviors (Henson et al., 2006). In this work, future time perspective is represented by Consideration of future consequences (CFC-F), defined as: "the extent to which individuals consider the potential distant

outcomes of their current behaviors and the extent to which they are influenced by these potential outcomes" (Strathman et al., 1994, p. 743), and Zimbardo Future (ZF), which reflects a general future orientation – the ability to work to achieve future goals. Future time perspective is positively associated with achievement-related outcomes, well-being, retirement savings, and health behavior (Kooij et al., 2018).

Future-oriented individuals are expected to be able to avoid the temptations of unhealthy behaviors and invest their time, efforts, and finances to attain better health in future.

Thus, our hypotheses were:

H3: Future TP is negatively related to unhealthy behaviors.

H3a1: CFC-F is negatively related to smoking.

H3a2: CFC-F is negatively related to unhealthy eating.

H3b: ZF is negatively related to smoking.

H4: Future TP is positively related to healthy behaviors.

H4a1: CFC-F is positively related to physical activity.

H4a2: CFC-F is positively related to healthy eating.

The present and future time perspectives often have the opposite associations with other constructs. Hence, there has been a scientific discussion on whether they are the opposites of one scale, or are different constructs. The debate affects CFC (Hevey et al., 2010; Joireman et al., 2008; Petrocelli, 2003; Rappange et al., 2009; Toepoel, 2010) to a greater extent than ZTPI (Daugherty & Brase, 2010), as CFC was initially introduced as a unidimensional construct by Strathman et al. (1994). A unidimensional time perspective conveys that on one extremity, there are people who care only about immediate outcomes, and on the other extremity, there are those who care about the more distant outcomes of their actions. While some researchers have insisted

that a two-factor solution is an artefact of reverse-coding of the items (Hevey et al., 2010), others have argued that a two-factor solution is more appropriate because it better represents the reality that individuals can equally care about the immediate and future outcomes of their actions. The fact that they do not care about immediate outcomes does not automatically mean that they care about future outcomes of their actions; additionally, the immediate and future subscales could differentially predict the outcomes in intertemporal choice situations (Joireman et al., 2012; Petrocelli, 2003).

Joireman et al. (2012) added two items to the initial 12 CFC items. A new 14-item CFC showed a better data fit as a two-dimensional model with CFC-immediate (CFC-I) and CFC-future (CFC-F) subscales. The authors showed that CFC-F influenced healthy eating and exercise behavior though promotion orientation. Moreover, numerous other studies revealed that CFC-I and CFC-F differentially predict other characteristics and behaviors. CFC-I (but not CFC-F) was associated with self-control (Joireman et al., 2008); smoking status and BMI-index (Adams, 2012); environmental concern and motivation (Arnocky, Milfont, & Nicol, 2014). McKay, Percy, and Cole (2013) found an association between both CFC-I and CFC-F and alcohol consumption, however, after the addition of other psychosocial variables, only the association between CFC-F and drinking behavior remained significant. Thus, we did not exclude that CFC-I and CFC-F could differentially predict health behaviors.

While Daugherty and Brase (2010) suggested a potentially unidimensional nature of ZTPI, Henson et al. (2006) argued for a multidimensional ZTPI and revealed that different dimensions of ZTPI independently predicted different health behaviors. For example, hedonism was associated with pleasurable risky behaviors such as unprotected sex and alcohol use,

whereas fatalism was related to health-damaging risk behaviors such as smoking and not using seatbelt.

In the present work, we studied the relationship between present and future dimensions of ZTPI with smoking behavior. The general prediction was that present time perspective variables would be positively associated with smoking, whereas a future time perspective variable would be negatively associated with smoking.

However, we did not exclude that different dimensions of ZTPI would have a different association with smoking. As, for instance, in Henson et al. (2006), present fatalistic could be a better predictor of smoking then present hedonistic. Furthermore, we investigated whether CFCS and ZTPI are distinct constructs, and tested which would be a better predictor of smoking, from both a variable-centered approach, discussed in this section, and a person-centered approach, discussed in the next section.

1.2.3. Person-centered approach and temporal profiles in different cultures.

The most commonly adopted method by researchers, the variable-centered approach is based on the relationship between separate variables or features. In personality research, it is also referred to as an attribute-centered approach as it focuses on isolated features between individuals. In contrast, the person-centered approach focuses on the patterns of the combination of features within individuals. Such patterns are called profiles, and the individuals are segmented based on such profiles. The person-centered approach accounts for the interaction between various features within an individual.

To date, the majority of research on time perspective has adopted a variable-centered approach, where separate dimensions of time perspective, for instance CFC-I or Zimbardo present hedonistic, have been linked to particular dependent variables, for example, health

behaviors. However, in the last decade, there has been a rising interest in exploring temporal profiles (Boniwell, Osin, Linley, & Ivanchenko, 2010; Cole, Andretta, & McKay, 2016; McKay, Andretta, Magee, & Worrell, 2014; Worrell, McKay, & Andretta, 2015). The profiles found differed from study to study in both their number and their nature (McKay, Andretta, Cole, & Worrell, 2018). All the studies reported a present and a future profile, and many found some variants of a balanced profile, as suggested by Zimbardo and Boyd (1999) (Boniwell et al., 2010, Worrell et al., 2015, McKay et al., 2014) or an ambivalent profile (Cole et al., 2016; McKay et al., 2018). The balanced profile was characterized by high scores on future, above average scores on present hedonistic, and low on present fatalistic, whereas the ambivalent profile was marked by average scores on all the subscales.

The individual time perspective is influenced by cultural norms and values, socioeconomic status and dominant religious orientation of the country (Boniwell & Zimbardo, 2004). Cross-cultural studies revealed differences in time perception and time orientation between countries (Ashkanasy, Gupta, Mayfield, & Trevor-Roberts, 2004; Hofstede and Minkov, 2010). Countries also differ by tempo, that is positively associated with economic well-being, the degree of industrialization. Compared to collectivist countries, individualistic countries value achievement more than affiliation. Individualism is highly related to faster tempos (Levine, 2008). Research shows that in times of economical crises when the future becomes insecure, people tend become more present-oriented (Morselli, 2013). Likewise, people living in the countries with unstable economic, social and political situation would have less perceived control over their future, and, thus, adopt a more negative, fatalistic and present-oriented time perspective (Sircova et al., 2015). In a combined sample from 23 different countries Sircova et al. (2015) identified 5 profiles, that were labeled: future-oriented (scoring

high on future and past negative, and above average on past positive), present-oriented (scoring high on present hedonistic and present fatalistic, and low on future), balanced (scoring high on past positive and future, below average on present hedonistic, and very low on past negative and present fatalistic), negative (scoring very high on past negative and present fatalistic, above average on present hedonistic, below average on future, and very low on past positive), and moderately fatalistic (scoring below average on all the variables). Gender and age differences among the profiles were very weak. Overall, the present-oriented, future-oriented and balances profiles were the most pronounced, however, there were found significant differences in the distribution of types among the counties. For example, France and New Zealand were characterized by the prevalence of present-oriented and negative profiles, China had emphasis on the moderately fatalistic and negative profiles, whereas in Estonia and Israel the balanced profile dominated. The study revealed that even Western countries differed from one another on the profile distribution. For instance, in USA, the dominant profile was the future oriented profile (40% of the sample) followed by the negative profile (24% of the sample). The dominant profile in UK was the balanced profile (32% of the sample), followed by the present- and future-oriented profiles (25% and 24% of the sample, respectively). In France, the prevalent profile was the present-oriented profile (30% of the sample), followed by the negative profile (21% of the sample). In this thesis we explored the temporal profiles of the Norwegian general population. Based on the fact all the previous studies on this topic reported finding the present and the future profiles, we expected to find at least these two profiles. As many studies found either a balanced or an ambivalent profile, we expected to find at least one of them in our study. It is reasonable to assume that some people don't prioritize the present over future or vice versa, but try to balance

between them, or don't particularly care about consequences of their actions in the present or future.

Establishing predictive validity of the clusters is a part of the process of establishing their validity (Clatworthy, Hankins, Buick, Weinman, & Horne, 2007). Membership in temporal profiles was shown to be associated with various health behaviors. In Cole et al. (2016), the present profile had a higher positive association with hazardous drinking behavior. McKay et al. (2014) reported a greater proportion of abstainers in the future and balanced profiles. Thus, in line with the extant research Our hypotheses were:

H4a: Individuals with the present profile score higher on unhealthy behaviors than individuals with the future profile.

H4b: Individuals with the future profile score higher on healthy behaviors than individuals with the present profile.

Furthermore, we tested whether membership in a CFC-based, ZTPI-based, or CFC+ZTPI-based profile would be a better predictor of health behaviors.

1.2.4. Domain-specific time perspective measurement

Extant research does not provide a unanimous answer as to which dimension of time perspective is better at predicting specific health behaviors (Adams, 2012; Arnocky et al., 2014; McKay et al., 2013; Rappange et al., 2009). This could potentially be caused by the rather low effect sizes of the models, where general time perspective is used to predict specific intentions and behaviors (Murphy & Dockray, 2018).

According to the principle of compatibility or symmetry (Ajzen & Fishbein, 1977), the correlation between the variables measured on the same level of generality should be higher. Thus, a rather low correlation between the general CFC and specific health behaviors could be

expected. The constructs that have commonly used domain-specific scales are self-esteem (Gentile et al., 2009); self-efficacy (McAvay, Seeman, & Rodin, 1996); and risk attitude (Weber, Blais, & Betz, 2002).

However, over the last decade, there has been a growing interest in the domain- and behavior-specific time perspective measurements. Naturally, individuals can have different motivations and priorities in life, and thus be more future-oriented in some domains and more present-oriented in others. Moreover, behaviors can be influenced by compensatory beliefs (Hope, Jones, Webb, Watson, & Kaklamanou, 2018; Miquelon, Knäuper, & Vallerand, 2012). Probst, Graso, Estrada, and Greer (2013) developed a work-safety-specific CFC that was related to work safety behaviors. Van Beek, Antonides, and Handgraaf (2013) and Dassen et al. (2015) used behavior-specific CFC, CFC-food and CFC-exercise which were highly correlated with respective behaviors. McKay, Perry, and Cole (2018) suggested that time perspective might be a domain-specific construct, as CFC from different domains did not necessarily correlate, which was also confirmed by Murphy, Cadogan, and Dockray (2020).

The present work tested whether domain-specific CFC-health would be a better predictor of health behaviors than general CFC. While the previous works studied domain-specific CFC in a within-subject design, we implemented a between-subject experimental design. Having CFC-general and CFC-health in the same questionnaire could lead to context effects. The prior answers could serve as a reference point for later answers as responses may be adjusted in order to maintain logical or psychological consistency, causing question order effects like, for example, an assimilation or a contrast effect (Schwarz & Sudman, 1992). Carlson, Mason, Saltiel, & Sangster (1995) showed that having general/ specific questions in one questionnaire is vulnerable to order effects. Moreover, questionnaire length and repetitiveness of items could

cause respondent fatigue, which, in its turn, could lead to lower response quality (Herzog & Bachman, 1981). The experimental design with a random allocation of the respondents to either a CFC-general or a CFC-health variant of the questionnaire helped us to mitigate the influence of the general and health-specific items on one another. It also enabled us to limit the length and repetitiveness of the questionnaire and, thus, lessen the respondent burden. Experimental and quasi-experimental designs are often used in studies comparing the effects of survey questions, definitions, and wording (Beaman & Dillon, 2012; Fisher, 2009).

Due to the wording of the original CFCS items, it's easy to make them domain- and behavior-specific, for example, replacing 'things' with 'health' in 'I consider how things might be in the future, and try to influence those things with my day to day behaviour', and 'behaviour' with 'health behaviour' in 'My behaviour is only influenced by the immediate (i.e., a matter of days or weeks) outcomes of my actions'. Moreover, previous studies on domain-specific time perspective have already adjusted CFCS to specific domains. To our knowledge, there has not yet been studies on domain-specific ZTPI, and the nature of ZTPI items would make it challenging to adjust them to a specific domain, for example: 'It is important to put excitement in my life', 'I do things impulsively', 'Meeting tomorrow's deadline and doing other necessary work comes before tonight's play', or 'I enjoy stories about how things used to be in the ''good old times'''. Developing a domain-specific ZTPI would could become a separate project with careful pretesting and validating of items. Due to resource limitation, we decided not to include domain-specific ZTPI in Paper 4.

Considering the previous research and in accordance with the principle of compatibility (Ajzen & Fishbein, 1977), we hypothesized the following:

H5: Predictive power of the health-specific CFC model is higher than of the CFC-general model.

1.2.5. Moderators of the relationship between time perspective and health behavior.

Another important research issue in the time perspective literature is to explore and understand the interaction between time perspective and other individual, social, and environmental constructs. In a recent meta-analysis of future time perspective, Kooij et al. (2018, p. 871) identified three broad categories of such constructs:

- Non-psychological variables such as age, gender and socioeconomic status

- Broad, cross situational personality and affective traits such as conscientiousness, openness, positive/negative affect, or optimism

- Broad, cross situational agentic traits related to the self like locus of control, self-esteem or self-efficacy.

This study contributes to the extant literature by investigating the moderating effect of the perceived connectedness to the future self and age on the relationship between time perspective and health behavior.

1.2.5.1. Perceived connectedness/ change in the future self

While the CFCS and ZTPI constructs reflect individual response to goals and other outward events in different time frames, the construct of perceived connectedness to the future self (also called future self-continuity, stability of identity or temporal connectedness) is directed inwards as it focuses on conceptualizing a self in time. Future self-continuity is an individual difference construct that reflects a perceived "overlap in personality, temperament, major likes and dislikes, beliefs, values, ambitions, life goals, ideals, and so on—held between one's current

and future self" (Bartels & Urminsky, 2011). The concept of self-continuity is derived from Parfit's (1971) idea of multiple temporal selves, that is the psychological representation of an individual in time as an accumulation of multiple selves, with each self corresponding to a particular time frame. The more features the selves share, the more psychologically connected they are. Thus, closer temporal selves are more connected than the selves located in more distant timeframes.

In case of high self-continuity, present and future selves are regarded as the same person, or a closely connected person. On the contrary, the future self that shares few characteristics with the present self can be perceived as a total stranger, and processed by the brain in a likewise manner (Ersner-Hershfield, Wimmer, & Knutson, 2010). Thus, individuals with low self-continuity tend to care about their future self less than individuals with higher self-continuity. Research indicates that individuals with low self-continuity demonstrate higher temporal discounting rates (Bartels & Urminsky, 2011); engage in unethical behavior (Ersner-Hershfield, Cohen, & Thompson, 2011) and procrastination (Blouin-Hudon & Pychyl, 2015); and have smaller savings (Ersner-Hershfield, 2011; Ersner-Hershfield, Garton, Ballard, Samanez-Larkin, & Knutson, 2009; Ersner-Hershfield et al., 2011). Chandler (1994) reported that the majority of suicidal adolescents tended to have low self-continuity. Bartels, Kvaran, and Nichols (2013) showed that individuals with low self-continuity were more willing to donate their future income to charity, whereas the degree of connectedness to the future self did not influence the amount of present donations.

Zhang and Aggarwal (2015) showed that perceived self-continuity could influence the transmission of a positive evaluation of a product, brand or pro-social cause from the past or future time frame to the present. Individuals with higher connectedness tended to carry positive

evaluations from the past or future into the present, which also effected their willingness to act on it in the form of a donation to a charity organization. Adelman et al. (2017) demonstrated the positive relationship of self-continuity with self-control and CFC-F, and the negative association of self-continuity with CFC-I. CFC-F and self-control mediated the effect of self-continuity on academic performance.

Recent research indicates that increasing future self-continuity can influence health behavior choices. Kuo, Lee, and Chiou (2016) showed that increased self-continuity due to interaction with virtual ideal selves influenced food choice during a tasting task. Rutchick, Slepian, Reyes, Pleskus, and Hershfield (2018) demonstrated that people with higher future self-continuity reported better subjective health, and individuals in the "continuity with the distant self" condition group were exercising more in the days following the task.

Sokol and Serper (2020) developed and validated the Future Self-Continuity Questionnaire (FSCQ). They reported that future self-continuity was positively associated with ZTPI future and CFC-F, and negatively associated with CFC-I.

The present work continued to investigate the link between perceived future self-continuity and health behavior. We operationalized perceived future self-continuity as perceived change in the future self (PCFS). In line with the theory and the previous findings, we hypothesized that if the anticipated change is large, the future self is perceived as a stranger, and thus its interests are devalued in comparison with the interests of the present self. Thus, the hypotheses were:

H6: PCFS is positively associated with unhealthy behaviors

H6a: PCFS is positively associated with smoking

H6b: PCFS is positively associated with unhealthy eating

H7: PCFS is negatively associated with healthy behaviors

H7a: PCFS is negatively associated with physical activity

H7b: PCFS is negatively associated with healthy eating.

The concept of future self-continuity is rather new and its relationship with time perspective is not sufficiently studied. The previous studies on the topic were of a cross-sectional nature, allowing to establish only an association between the constructs. To date, there has not been any longitudinal or experimental studies that could establish the direction of the relationship between future self-continuity and time perspective. The rationale for bidirectional relationship can be performed. Considering CFCS, on one hand, the fact that individuals perceive their future self as a stranger could cause them to devalue the future consequences of their actions. On the other hand, we can argue that CFC may influence future self-continuity. As it was shown experimentally (Kuo et al., 2016), one of the things influencing future self-continuity is vividness of one's future self. Thus, individuals valuing the immediate consequences more than future consequences, may avoid thinking about their future in order to deal with cognitive dissonance (McGrath, 2017). Considering the lack of empirical studies showing the direction of the relationship between CFC and perceived change in the future self , we decided to explore their interaction effect. Thus, we tested whether perceived change in the future self moderated the relationships between CFC and health behaviors. We hypothesized that individuals who highly esteem the immediate consequences of their actions could still sacrifice them for the benefit of their future self if they feel connected to it, that is, score low on perceived change in the future self . On the contrary, those who expect a lot of change in their future self – and thus perceive the future self as an unknown person – would be encouraged to act on their immediate impulses, and would be reluctant to invest time, effort and money into healthy activities.

H8: PCFS strengthens the association between CFC-I and health behaviors

H8a1: PCFS strengthens the positive association between CFC-I and smoking

H8a2: PCFS strengthens the positive association between CFC-I and unhealthy eating

H8b1: PCFS strengthens the negative association between CFC-I and physical activity

H8b2: PCFS strengthens the negative association between CFC-I and healthy eating.

On the other hand, we hypothesized that individuals considering the future consequences of their actions would still fail to act on their beliefs in the case of low perceived connectedness to the future self:

H9: PCFS weakens the association between CFC-F healthy behaviors

H9a1: PCFS weakens the negative association between CFC-F and smoking

H9a2: PCFS weakens the negative association between CFC-F and unhealthy eating

H9b1: PCFS weakens the positive association between CFC-F and physical activity

H9b2: PCFS weakens the positive association between CFC-F and healthy eating.

As with CFC, considering ZTPI, we could also find rationale for bidirectional relationships between its dimensions and perceived change in the future self . Moreover, we expect even more complicated relationships due to the inclusion of the past dimension. When we planned our study, there was no previous studies on the relationship between ZTPI and perceived change in the future self known to us. Therefore, as our study focused only on the present and

future TP and excluded the past and considering the lack of theories and previous studies on the topic, we decided to concentrate only on exploring the relationships between CFC and future self-continuity.

1.2.5.2. Age

During life individuals go through different developmental changes, such as infancy, adolescence, adulthood, old age, and developmental transitions, such as starting school, a family, or retirement (Lim, Schneider, & Janicke, 2018). At different ages and different developmental stages different intervention strategies are needed. The abilities to implement and maintain health behavior changes can be dependent on the development stage. For example, parents control most of health behaviors of their preschool children, and, thus, parents are a primary target of health intervention campaigns (Patrick & Nicklas, 2005; Suryadevara, Bonville, Ferraioli, & Domachowske, 2013). Adolescence is characterized by rapid physical, cognitive and emotional development. This makes adolescents more susceptible to sensation seeking and risky behaviors and having worse impulse control than adults (Lubman, Yücel, & Hall, 2016; Steinberg, 2005). Research shows that future orientation develops during adolescence, older adolescents display less delay discounting than younger adolescents (Steinberg et al., 2009). Peer influence is another factor affecting health behavior choices in adolescents (Prinstein, 2001).

Emerging adulthood is a period when individuals enter legal age to drive and buy alcohol and tobacco products, many start living independently, start college or enter the work force, and, thus, make decisions that form their identity and their habits, including health habits (Arnett, 2000; Arnett & Padilla-Walker, 2015; Frisén & Wängqvist, 2011). Emerging adults are less likely to be monitored by their parents than adolescents, and less likely to be constrained by adult responsibilities related to marriage and parenthood. The prevalence of such health risk behaviors

as unprotected sex, risky driving, and substance use peak during emerging adulthood (Arnett, 2000).

Parenthood is an important developmental transition of adult individuals when priorities, attention and commitment shift to the role of caregiver (Hagger & Hamilton, 2019). Parenthood can influence health behavior in opposite ways. On one hand, parents might sacrifice their own needs in favor of the needs of the child. For example, such beliefs as interference with other commitments, lack of time and inconvenience were negatively associated with regular physical activity among mothers and fathers of young children (Hamilton & White, 2010). Physical limitations, fatigue and stress can also have negative influence on parents' health behaviors. Merkx, Ausems, Budé, de Vries, and Nieuwenhuijze (2017) showed that more than a half of healthy pregnant women reduced their exercise activity because they experienced tiredness and/or pain. On the other hand, becoming a parent and a role model for their children can lead individuals to reappraisal of lifestyle can motivate them, for example, to eat more healthily (Bassett-Gunter et al., 2013) or to quit smoking (Moan, Rise, & Andersen, 2005).

Elderly people experience health decline, their perceived time left in life and future horizons shrink, while mortality becomes more salient (Löckenhoff, 2011). Individuals which perceive time as constrained tend to prioritize more short-term goals providing emotional meaning and optimize psychological well-being and prefer positive information, whereas individuals with open-ended time perception are most likely to prioritize more preparatory goals, such as expanding knowledge and experience and seek for negative information. However, research shows that it is the constrained time perspective, and not chronological age, that drives these effects as younger people with a terminal diagnosis and people under catastrophic events that prime the fragility of life tend to prioritize the same goals as elderly people (Carstensen,

2006). Nevertheless, due to changes in subjective time perspective, the events in future might be perceived as closer to older people than to younger people, which, in its turn, can influence temporal discounting rates (Löckenhoff, 2011). Thus, from the examples mentioned above we can see that developmental changes and transitions that are often associated with age can influence decision making in general and health decisions in particular.

Decision making is defined as a "high-level" cognitive process of selecting among alternatives. This process involves active judgment of different alternatives (Gonzales, 2017). The constructs of time perspective imply decision making, as they include a choice between immediate and future benefits. Guthrie et al. (2014) suggested that such active decision making with an evaluation of possible alternatives particularly occur at the stage of behavioral onset. This is the time at which individuals are actively considering adopting a behavior, weighing its costs and benefits. Once considered, the behavior might be not re-evaluated at later stages in life, but rather become habitual. Contrary to the process of active decision making, habitual actions are a consequence of repetitive, non-deliberate choice (Lindbladh & Lyttkens, 2002).

Thus, Guthrie et al. (2014) suggested that the relationship between time perspective and health behavior could be influenced by age. The authors reported that the earlier studies where participants were between 11 and 37 years of age found a significant association between time perspective and various health behaviors more consistently than the studies including older adults. The authors reported that the association between time perspective and exercising and obesity was significant for the youngest group but not for older groups. The relationship between time perspective and smoking was not significant in any of the age groups.

Thus, in our work we decided to further investigate the moderating effect of age on smoking behavior. Even though snus usage is the most common form of tobacco consumption

among young people (Statistics Norway, 2020b), we decided not to include it in our study because snus is often promoted as and believed to be a tobacco harm reduction product (Lee, 2011). Studies show that using snus can be perceived as less risky than smoking and helpful in quitting smoking (Choi, Fabian, Mottey, Corbett, & Forster, 2012). Earlier research showed heterogeneous results concerning the association of time perspective and smoking (Adams & White, 2009; Griva, Tseferidi, & Anagnostopoulos, 2014; Henson et al., 2006; Keough et al., 1999). Smoking behavior initiation prevails during teenage and young adult years (Marcon et al., 2018). During that time individuals go through several stages, such as contemplation, trying, experimenting and regular smoking before they eventually become established daily smokers and that behavior becomes habitual (Mayhew, Flay, & Mott, 2000). Thus, we can expect that during teenage years and young adulthood, i.e. during smoking onset, individuals are more likely to actively consider the behavior, and weigh the alternative consequences, including negative health consequences in the future. During this stage we could expect that time perspective would influence the decision about smoking initiation and maintenance.

Like Guthrie et al. (2014), we used age as a categorical variable. As it is developmental stages and developmental transitions that influence health behaviors and the relationship between time perspective and health behaviors, rather than age itself, we considered that it would be more appropriate to divide participants into age groups rather than use age as a continuous variable. Such developmental transitions as starting to live independently, starting a family, and becoming a parent, do not happen at one particular age, but rather during some age period. However, unlike Guthrie et al. (2014), who tested three age groups (18 – 24; 25 – 34; and 35 and older), we divided the respondents into two groups: 18 – 34 and 35 – 65.

Our decision was guided by several considerations. First, if individuals quit smoking before the age of 35, the health damage can be reversed (Doll, Peto, Boreham, & Sutherland, 2004). That means that it is important to direct health communication and behavioral intervention programs at this segment. Second, the age of 35 in Norway is the age at which most people have started their own family. According to Statistics Norway (2020a), in 2019, the average age of getting the first child was 32 years for men and 29.8 years for women. Quitting smoking can be guided by alternate reasons than caring about the future health consequences. The intentions to be a good example for the children (Halpern & Warner, 1993) and to reduce child exposure to tobacco smoke (K. E. Lund & Helgason, 2005) are considerable motivational factors. Third, smoking risk awareness is much higher now than it was several decades earlier, when the older smokers had their behavior onset (M. Lund, Lund, & Kvaavik, 2011). Besides, as a result of the rise in health risk awareness, restrictive social policies and institutional discrimination, social unacceptability and stigmatization of smoking have dramatically increased during the last decades (Stuber, Galea, & Link, 2008). For example, Nyborg and Rege (2003) found that the Norwegian smoking law amendments changed social norms concerning non-smoker exposure. Thus, older people made their decision about smoking behavior onset when the health risk awareness and social stigmatization of smoking behavior was not as pronounced as now. Moreover, they are more likely to be hard-core smokers, and thus more addicted (Emery, Gilpin, Ake, Farkas, & Pierce, 2000). Habits, addiction, and alternative motivation to quit smoking are some of the factors that could potentially weaken the relationship between time perspective and smoking. Thus, our hypotheses were as follows:

H10: Age weakens the relationship between TP and smoking

H10a: Age weakens the positive association between CFC-I and smoking

H10b1: Age weakens the positive association between ZPH and smoking

H10b2: Age weakens the positive association between ZPF and smoking

H10c: Age weakens the negative association between CFC-F and smoking

H10d: Age weakens the negative association between ZF and smoking.

Like Guthrie et al. (2014), we tested the moderating effect of age on the relationship between present and future TPs of ZTPI and smoking; additionally, we investigated whether the same effect would apply to the relationship between CFC-I and CFC-F and smoking.

1.3. Methods

This work uses a quantitative study design for hypothesis testing and a survey with self-reported measures as a data collection technique. Structural equation modelling (SEM) and cluster analysis are used as analytical techniques. The fourth paper incorporates experimental design in addition to the survey.

1.3.1. Data and data sources

The data for the first three papers was collected from a general Norwegian population with the help of a reputable survey agency. The data was representative of the Norwegian general population based on gender, age, and region. The agency set up with quotas on gender, age and regions according to the data from Statistics Norway (SSB). After the data collection the agency checked whether the gathered data was representative of the general population according to the above-mentioned criteria. Because of the large number of items in the questionnaire, the data was collected from the same respondents in two stages. However, some of the participants dropped out from the second stage, hence the difference between sample sizes.

The flexibility of SEM makes it difficult to develop generalized guidelines concerning sample size. Rules of thumb, such as a minimum sample size of 100 or 200, 5 to 10 observations per parameter, or 10 cases per variable, are not model-specific and can lead to grossly overestimated or underestimated sample size requirements (Wolf, Harrington, Clark, & Miller, 2013). When choosing a sample size, the most important consideration is to achieve adequate statistical power. The power of the test is the chance that we find the effects that exist in a population significant in our sample. It depends on the chosen statistical significance level (conventionally 0.05 in social sciences), effect size and sample size (Hair, Black, Babin, & Anderson, 2013). Monte Carlo analyses performed by Wolf et al. (2013) revealed that required sample sizes varied from 30 to 460, and that the greater number of indicators of a factor decreased a minimum sample size requirement. Thus, strong effects can be found in smaller sample sizes, however, there is a risk that in a very large sample we will find even very small effects significant. All the three parameters should be considered when choosing the sample size for the study. However, when planning a study, we should also weigh the cost of increasing the sample size versus the practical benefit of doing it. When testing an effect of a drug in medical studies, even smallest effects can have practical meaning since it translates into a number of saved or lost lives. Considering studies on the impact on a health behavior, very minor effects would have little practical meaning, for example, if one variable would explain 0.7% of the variance in a health behavior. Using the calculator by Soper (2020), we find that to achieve the statistical power of 80% at the significance level .05 and effect size .17, the minimum sample size is 316, whereas with a medium effect size of .3, the minimum sample size could be as low as 90. Moreover, we considered previous studies on the similar topic that used the following

general population samples: N=300 (Crockett et al., 2009); N=146 (Dassen et al., 2015); N=165 (van Beek et al., 2013).

There are no guidelines concerning optimal sample size for cluster analyses (Dolnicar, 2002). Dolnicar (2000) reported that in 243 segmentation studies from a systematic review half of the studies had a sample size of less than 300 with median sample size of 293. Breckenridge (2000) suggested that the minimal sample size for a cluster analysis should be N=120. Previous studies on temporal profiles used sample sizes as low as N=455 (Cole et al., 2016) and N=179 and N=289 (Boniwell et al., 2010).

In Papers 1 and 3, we analyzed the responses from 346 participants – 177 women (51%) and 169 men – aged between 18 and 65 (mean = 42). In Paper 2, we analyzed the responses of a total number of 494 participants – 258 women (52%) and 236 men – aged between 18 and 65 (mean = 40). The fourth paper was based on the data collected via an online survey from the students of the Arctic University of Norway. The number of valid responses was 445 for a general questionnaire and 465 for a health-specific questionnaire. The mean age of participants was approximately 27 years, and the sample had approximately 60% of women. The questionnaires were given in Norwegian.

Earlier research (Johnson, 2005) has shown that unsupervised internet surveys can be subject to careless responding defined as "responding without regard to item content" (Nichols et al., 1989 cited from (Meade & Craig, 2012, p. 437). The estimated number of careless responses in such surveys varies greatly depending on the approach used (Kurtz & Parrish, 2001; Meade & Craig, 2012). Meade and Craig (2012) suggest using several approaches for identifying careless responses. In Paper 4, we used three approaches to identify careless respondents: long string index, psychometric synonyms and antonyms, and Mahalanobis distance. First, with the help of

Excel, we identified maximum long strings of the same response category without regard for item wording. Before proceeding with further analyses, we removed the responses with extremely long strings (≥ 18). Then, we calculated a combined index based on the answers given on psychometric synonyms and antonyms, and Mahalanobis distance. The responses with high scores on the index were removed from the further analyses. In total, we removed 10.6% of responses from a general questionnaire and 7.6% of responses from a health-specific questionnaire. This number was close to the careless response estimation provided in Meade and Craig (2012).

1.3.2. Measures

The latent constructs of Consideration of future consequences and Zimbardo time perspective used in this study are measured reflectively though the items from the Consideration of Future Consequences Scale (CFCS) and Zimbardo Time Perspective Inventory (ZTPI). The validity of these measurement instruments, including the short versions of ZTPI, has been tested in numerous studies (D'alessio, Guarino, De Pascalis, & Zimbardo, 2003; Joireman et al., 2008; Joireman et al., 2012; Košťál, Klicperová-Baker, Lukavská, & Lukavský, 2016; McKay, Morgan, Van Exel, & Worrell, 2015; McKay, Perry, Percy, & Cole, 2016; Toepoel, 2010); in different populations (Bruderer Enzler, 2015; McKay, Ballantyne, Goudie, Sumnall, & Cole, 2012; Ryack, 2012; Worrell & Mello, 2007); and in several languages (Anagnostopoulos & Griva, 2012; Carelli, Wiberg, & Wiberg, 2011; Milfont, Andrade, Belo, & Pessoa, 2008; Nigro, Cosenza, Ciccarelli, & Joireman, 2016; Orkibi, 2015; Przepiorka, Sobol-Kwapinska, & Jankowski, 2016; Zhang, Howell, & Bowerman, 2013). This work used Joireman et al. (2012) CFC-14 scale and the present and future dimensions of Wakefield, Homewood, Taylor, Mahmut, and Meiser (2010) short ZTPI-scale. Examples of the CFC items include: "I only act to satisfy

immediate concerns, figuring the future will take care of itself" for CFC-I and "When I make a decision, I think about how it might affect me in the future" for CFC-I. Examples of the ZTPI items include: "I make decisions on the spur of the moment" for ZPH; "It doesn't make sense to worry about the future, since there is nothing that I can do about it anyway" for ZPF; and "Meeting tomorrow's deadline and doing other necessary work comes before tonight's play" for ZF. In addition, Paper 4 used a domain-specific CFC-health scale adapted from van Beek et al. (2013), which included, for example: "I consider how my health might be in the future, and try to influence my future health with my day to day behavior". All of the items were measured with the help of a 7-point Likert scale from –3 (completely disagree) to +3 (completely agree).

The measure of perceived change in the future self used in Paper 3 was adapted from the measurement of perceived connectedness to the future self by Ersner-Hershfield et al. (2009) and Bartels and Urminsky (2011), which was inverted and rephrased due to the fact that many of the respondents initially failed to report a similarity between their future and present selves, and reported future change instead. The participants were instructed to "Think about the important characteristics that make you the person you are now—your personality, temperament, major likes and dislikes, beliefs, values, ambitions, life goals, and ideals", and then asked to how much their personality would change in 1 year/ 10 years/ 20 years. This was measured on an 11-point scale, ranging from "0% change/absolutely the same person" to "100% change/completely different people" with an interval of 10%. In addition, the participants we asked to estimate on a 7-point Likert scale from –3 (completely disagree) to +3 (completely agree) the following statement: "My personality will change a lot in the future". A perceived change in the future self variable was computed as an average of three items: perceived change in 10 years, perceived change in 20 years,

and a general measure of perceived change. To be able to compute the average of different scales, we had to recode the scales into from 1 to 7 and from 1 to 11, respectively, and normalize them.

Health behavior measures in the study are self-reported frequency measures of smoking, exercising, walking, and healthy and unhealthy eating. Although prone to various biases (Paul, Rhodes, Kramer, Baer, & Rumpler, 2005; Prince et al., 2008), these measures are commonly used to assess habitual behavior (Hall & Fong, 2003; Henson et al., 2006; McKay et al., 2013; Strathman et al., 1994). Smoking behavior was assessed with one question: "On average, how many portions (i.e. number of cigarettes/pipes) per day have you smoked during the last month?" on a 9-point scale from 0 to 60 or more portions per day. Eating/ drinking habits were assessed with a question "How often do you drink/eat …?" Unhealthy eating was a combination of three habit measures: eating cakes, unhealthy (sweet/salty) snacks, and drinking beverages with high sugar content; while healthy eating was represented by eating fruit and vegetables. The items were measured on a 9-point scale ranging from "never" to "several times per day". Physical activity included walking ("How often do you walk?") and exercising ("How often do you exercise so that you become short of breath or sweat?"). The items were measured on a 7-point scale ranging from "never" to "every day".

In addition, Paper 4 measures self-assessed eating, physical activity, and exercise habits measures with the following questions: "How would you rate your general eating/physical activity and exercising habits?" assessed on the 7-point scale ranging from 1=very unhealthy to 7=very healthy. Moreover, as one of the aims of Paper 4 was to compare the predictive power of the domain-specific CFC-health with behavior-specific CFC-food and CFC-health used in van Beek et al. (2013) that did not differentiate between healthy and unhealthy behaviors, we aggregated healthy and unhealthy eating into one scale.

1.3.3. Data analysis

Since we used well established scales for measuring consideration of future consequences and Zimbardo time perspective, we did not need to perform an exploratory factor analysis, but only a confirmatory factor analysis in order to test for convergent and discriminant validity with the help of AMOS (Anderson & Gerbing, 1988). Considering the debate around a number of factors of the Consideration of future consequences scale, we compared model fit of a one- versus two-factor CFC model (Bagozzi, Yi, & Phillips, 1991).

Further, a structural equation (SEM) analysis was performed in order to test the hypotheses. The explanatory power of the model was estimated. The advantage of using a SEM analysis is that it allows to estimate the data fit of the whole model simultaneously estimating relationships between latent variables and their indicators and interrelationships between the variables. SEM has become a quasi-standard in marketing research, and covariance-based SEM (CB-SEM) have been predominantly used (Hair, Sarstedt, Ringle, & Mena, 2012).

The assumptions of the covariance-based SEM (CB-SEM) are a large enough sample size and normal distribution. As a perfectly normal distribution almost never appears in real data, there came many recommendations to use variance-based SEM (VB-SEM or PLS-SEM) as it does not pose requirements on sample size and distribution. However, PLS-SEM lacks measures for overall model fit, and, thus, cannot be used for theory testing and for comparing alternative model structures (Hair et al., 2012) thus PLS-SEM should only be used for exploratory analyses, whereas CB-SEM should be used for confirmatory analyses. Using Monte Carlo simulation. Goodhue, Lewis, and Thompson (2012) evaluated PLS, multiple regression, and CB-SEM in terms of accuracy and statistical power. The authors found that in small sample sizes ($n < 90$) CB-SEM was inferior to PLS-SEM. However, in large sample sizes ($n \geq 90$) all the three techniques were robust against moderate departures from normality. All the items used in the

model, except for smoking, had slight to moderate departure from normality with skewness and kurtosis values within the acceptable range of +/−1 (Hair, Hult, Ringle, & Sarstedt, 2016). Therefore, we chose to use CB-SEM in our analyses.

The age moderation effect was tested with the help of multigroup SEM-analyses and a chi-square difference test for invariance of the models as whole and individual paths. A similar test was used to assess whether the results for a general and a health-specific model in Paper 4 were significantly different. We compared the models where all regression paths between independent and dependent variables were constrained with an unconstrained model. This helped us to establish the statistical significance of the difference between predictive power of the models, and between the models on path-by-path level. The moderating effect of perceived change in the future self was tested with the help of SEM-analyses of the models with the interaction effect (Dawson, 2014). In order to test interaction effect, we needed to create product variables. To do so, we first performed a confirmatory factor analysis in AMOS and then we chose to create composite variables out of latent variables with indicators using regression imputation in AMOS. This function in AMOS creates or "imputes" observed composite variables from the latent variables with indicators based on the factor score estimates obtained in the confirmatory factor analysis.

Further, the clusters in Paper 2 were identified in SPSS though the procedure that was shown to perform best for large sample sizes (N > 300) (Clatworthy et al., 2007). First, to identify the number of clusters and initial cluster centroids, we performed hierarchical cluster analyses, Ward's method. Then, we used K-means cluster analyses with a simple Euclidean distance similarity measure to fine-tune our cluster solution. The input variables were standardized prior to analysis (Hair et al., 2013). As a cluster analysis will identify clusters even

if data is homogeneous, it's important to thoroughly validate cluster solutions (Clatworthy et al., 2007). To validate the cluster solutions, we split the sample randomly in half, and compared whether the cluster analyses would reveal the same clusters in both halves. The cluster differences for various health behaviors were established through a number of t-tests performed in SPSS. To estimate effect size, Cohen's d was calculated (Cohen, 1992).

Previous research showed that age, gender, and family status (living alone or with others and having or not having children) could influence health behavior (Craft, Carroll, & Lustyk, 2014; Deeks, Lombard, Michelmore, & Teede, 2009; Jeong & Cho, 2017; Wardle et al., 2004; Zanjani, Schaie, & Willis, 2006) Thus, we controlled the models for these variables. Since these variables did not have any effect in the models in our studies, we decided not to put emphasis on control variables in the papers.

Part II. Main findings, discussion, and practical implications.

The main goal of this work was to advance the knowledge about the concept of time perspective and its relation to health behavior to help in developing more effective health communication and health behavior intervention programs. The following research questions are answered in the four papers of the present dissertation: Are time perspective constructs different, and yes, which are better at explaining health behaviors? Are present and future time perspective mutually exclusive, or can an individual be equally concerned for both present and future? If present and future time perspectives are different dimensions: Do present and future time perspective differentially predict healthy and unhealthy behaviors? How many groups of individuals with similar temporal profiles can be identified, and what is their health behavior? Does the age influence the relationship between time perspective and health behavior? Is health-

specific time perspective better at predicting health behavior than a general time perspective? The findings of the study and their practical implications are summarized and discussed below.

2.1. Discriminant validity of present and future dimensions of ZTPI and CFCS and their relationship with health behavior.

The first objective of the present work was to compare the present and future dimensions of ZTPI and CFCS and their influence on health behaviors, addressing the call by Joireman and King (2016). The majority of the earlier studies assessing the discriminant and convergent validity of CFCS and ZTPI used a one-dimensional CFCS by Strathman et al. (1994), whereas this work uses a two-dimensional 14-item CFCS by Joireman et al. (2012). Papers 1 and 2 showed that CFC and ZTPI are though similar, but yet different constructs, representing the different dimensions of the broader construct of time perspective. In the variable-centered approach (Paper 1), Zimbardo present fatalistic had a higher correlation with consideration of immediate consequences than Zimbardo present hedonistic, and only Zimbardo present fatalistic and CFC-I had a significant correlation with smoking behavior (hypotheses H1a1 and H1b2 were confirmed, while H1b1, H3a1 and H3b were not). A ZTPI-model was better at predicting smoking behavior than a CFC-model.

The practical implication of these findings is that while developing intervention programs for smoking, it might be important to take into account that it is the present time perspective and the consideration of immediate consequences that drive the behavior, and not the future time perspective. We found that the present fatalistic time perspective had the strongest effect on the smoking behavior. Zimbardo present fatalistic stands for the belief that forces beyond one's control, such as fate, decide the future. Thus, the study results suggest that programs that are

directed towards decreasing fatalism might be more effective than programs emphasizing future health damage from smoking.

The results for the person-centered approach (Paper 2) will be discussed below in subpart 2.3.

2.2. The dimensions of CFCS and health behavior

The second objective of this work was to establish discriminant validity of the present and future dimensions of CFC, and to test whether these dimensions differentially predict healthy and unhealthy behaviors. We showed that the CFC scale incorporates two dimensions: consideration of immediate and future consequences in both general (Papers 1 and 3) and student populations (Paper 4). This is also true for the health-specific CFCS (Paper 4). In Paper 3 consideration of immediate consequences had significant relationship with unhealthy behaviors (hypotheses H1a1 and H1a2 are confirmed, while H2a1 and H2a2 are not), whereas consideration of future consequences was significantly linked to healthy behaviors (hypotheses H4a1 and H4a2 are confirmed while H3a1 and H3a2 are not). This finding supports Joireman et al.'s (2012) suggestion that the relationship between time perspective and health behavior is mediated by the regulatory focus (Higgins et al., 1994). In our study the relationship might be mediated though the promotion, but not the prevention focus. I.e. individuals that score high on the consideration of immediate consequences tend to adopt unhealthy behaviors, but at the same time they are not more likely to avoid the present costs of healthy behaviors. Likewise, future-oriented individuals are more likely to invest in activities that promote future health, however, they are not more likely to avoid unhealthy behaviors.

The practical implication of these results is that in the Norwegian population the programs aimed at reducing immediate attractiveness of unhealthy behaviors and providing with

coping strategies of overcoming temptation might be more effective than the programs telling about future health risks of such behaviors. For healthy behaviors, the programs emphasizing future health benefits might be more effective than those aimed at reducing the present cost of the behavior.

2.3. Temporal profiles to predict health behavior

The third objective of the study was to explore the temporal profiles in the Norwegian population on the basis of CFCS, ZTPI-present/future, and a combination of those. In all three cases we found the present and the future profile. In all three cases individuals in the present and future profiles did not differ on age, region they live in, living alone or with others, and living with children of different ages. When it concerns gender, there was an equal number of males and females in the present group, and there were slightly more females than males in the future profiles (54 vs. 46% respectively), however, this difference was not statistically significant ($p=.23$). The individuals in the profiles differed on the highest accomplished education. There were more individuals with lower secondary education and upper secondary education in the present profile, whereas there were more individuals with bachelor and master-level education in the future profile. In ZTPI-based present and future profiles the distribution of the individuals with lower and upper secondary education was 48% vs. 31% respectively. In CFCS-based present and future profiles the distribution of the individuals with lower and upper secondary education was 45% vs 33% respectively. Generally, the individuals with the present profile reported less healthy behaviors and scored lower on health intentions than the individuals in the future profile (hypotheses 4a and 4b confirmed).

The present and future groups of individuals identified on the basis of CFCS were more different on health behaviors than the groups identified on the basis of ZTPI. However, the

groups identified on the basis of both ZTPI and CFCS variables were more predictive of various health behaviors and intentions than only CFCS-based groups, with the exception of eating behavior.

Interestingly, in Paper 1 with a variable approach a ZTPI-model had slightly better predictive power on smoking behavior than a CFC-model, whereas ZTPI-based profile membership is a worse predictor of smoking behavior than CFCS-based profile membership. This may be caused by the fact that, unlike CFCS, ZTPI has two present dimensions and only present fatalistic was significantly associated with smoking behavior, while present hedonistic was not associated with it. ZTPI profile membership was determined by all the dimensions at the same time, and the present profile was characterized by higher scores in both present fatalistic and present hedonistic.

The practical implication for the development of health intervention programs is that when segmenting the public on the basis of time perspective, it would be more preferable to use both ZTPI and CFCS scales. And in case of scarce resources, the CFCS-based segments would be preferable to ZTPI-based segments. If using ZTPI-questionnaire only, the variable-based approach is preferable to clustering.

2.4. Domain-specific CFC

The fourth objective of the present work was to test whether a domain-specific CFC-health would predict various health behaviors better than a general CFC. This work (Paper 4) was the first to experimentally show that CFC-health was better at predicting health behaviors than CFC-general, the explanatory power of the models equaled .31, .24, .22 and .18 versus .05, .07, .04 and .09, respectively (hypothesis H5 confirmed). Furthermore, the predictive power of

the model with CFC-health was comparable to that of behavior-specific CFC, such as CFC-exercise, CFC-food (van Beek et al., 2013). The results confirm that individuals can vary in their time perspective from domain to domain. For example, one can be future-oriented in the field of education, but simultaneously present-oriented in the domain of health.

The finding has a significant practical implication for future studies and mapping the population during behavior intervention programs. The results of the present study suggest that using CFC-health instead of a general CFC in models with different health behaviors might help to increase effect sizes and overall predictive power of the models in future studies, and thus, decrease the ambiguity of the findings. Moreover, in situations where resources are limited and it is not possible to use behavior-specific CFC scales, it could be better to use CFC-health instead of a general CFC when planning and implementing behavior intervention programs.

2.5. Perceived change in the future self and health behavior

The fifth objective of this work was to study the main effect of perceived self-continuity on health behavior, and its moderating effect on the relationship between CFCS and health behaviors. Our study (Paper 3) revealed that perceived change in the future self had a significant negative association with healthy behaviors and moderated the effect of CFC on unhealthy behaviors (hypotheses H7a and H7b, and H8a1, H8a2, H9a1 and H9a2 are confirmed, whereas H6a, H6b, H8b1, H8b2, H9b1 and H9b2 are not). This means that individuals, believing that their personality will undergo significant change in future, i.e. having less connectedness to their future self, are less likely to invest in healthy behaviors. Furthermore, perceived change in the future self dampened the negative effect of CFC-F on the unhealthy behaviors and strengthened the effect of CFC-I on unhealthy behaviors.

This finding reveals the need for intervention programs aimed at reducing individual perceived change in the future self and, thus, increasing psychological connectedness to the future self.

2.6. Age as a moderator of the relationship between time perspective and smoking

The sixth objective of our work was to check whether age would moderate the relationship between time perspective and smoking behavior. Paper 1 has shown that the predictive power of the model was higher in the younger group (R2 = .09 and .18) compared to the older group (R2 = .02 and .02) for CFCS and ZTPI models respectively. However, we were unable to achieve significant results on the chi-square difference test. The difference on the model level was only significant at the 90% confidence interval for CFCS model. Nevertheless, the relationship between TP and health behavior was only significant for the younger group. The finding seems to support the suggestion by Guthrie et al. (2014) that time perspective influences health behavior in the period of behavioral onset when individuals are making active decisions about their smoking behavior.

2.7. Limitations and suggestions for future research.

Despite several theoretical and practical contributions of this work, it has some limitations that should be addressed by future research. One of the limitations of the survey method is its self-reported nature. While aiming to estimate actual behavior, self-report measures can deviate significantly from objective measures of behavior (Rhodes, Janssen, Bredin, Warburton, & Bauman, 2017). Though objective measures also have their limitations (Conner & Norman, 2017), the future research is encouraged to test the link between time perspective and actual health behavior.

Another general limitation of the work lies in its cross-sectional nature that did not allow to establish causality between time perspective and health behavior. Future experimental research on this topic is necessary. One of the possible avenues is though manipulating perceived connectedness with the future self (Bartels & Urminsky, 2011).

Though, the covariance-based SEM is shown to be robust in large samples with moderate departures from normality, one variable in our study – smoking – had an extremely skewed distribution that could potentially influence test results. Thus, we performed alternative analyses of the models tested in paper 1. As our data had a lot of 0 counts (ca. 70% of the respondents did not smoke daily), we first performed a series of zero-inflated regression analyses. The analyses revealed that time perspective was only associated with smoking status, i.e. whether the person was a smoker or a non-smoker, but not the amount of the cigarettes smoked. Thus, we concluded that smoking should be recoded into a categorical variable and analyzed with the help of a logistic regression. Though due to the differences between the two approaches it is hard to compare exact coefficients attained in the logistic regression analysis and the SEM-analysis, the results were similar. Both in the total sample and in the younger group only CFC-I and Zimbardo present fatalistic were associated with smoking. In the older group none of the time perspective variables was associated with smoking in SEM, in the logistic regression analysis, Zimbardo present fatalistic, but not CFC-I was significantly associated with smoking. In SEM the association between CFC-I and smoking was $r=.17$ ($p<.05$) and .34 ($p<.05$) for in the total sample and in the younger group, respectively. In logistic regression analyses the estimates were: .33($p<.01$) and .64($p<.01$) for the general sample and the younger group respectively. In SEM the association between Zimbardo present fatalistic and smoking was $r=.23$ ($p<.01$) and .45 ($p<.01$) for in the total sample and in the younger group, respectively. In logistic regression

analyses the estimates were: .33($p<.01$), .64($p<.01$), .28($p<.05$) for the general sample, the younger group, and the older group respectively. The Chow test revealed that the difference between the groups was not significant: $F=1.87$, $p=.13$ for CFCS model, and $F=1.02$, $p=.40$ for ZTPI model. As we can see from the results, SEM-analysis showed to be robust even in the case of an extremely skewed distribution. However, when testing the relationship between time perspective and smoking, it is more appropriate to analyze smoking as a binary categorical variable rather than a continuous variable.

A reason for the finding that the relationship between time perspective and smoking behavior was only significant in the younger group, could be that the active decision making occurs only during behavioral onset. The fact that time perspective involves active decision making with evaluation of more immediate and more distant alternatives, makes this construct interesting to study in connection with initiation of a health behavior or a health behavior change. The onset of such health destructive behaviors as substance use, risky driving and risky sex behavior is predominantly associated with a particular age period, that is teenage years and young adulthood (Cooper, Shapiro, & Powers, 1998; Enstad, Evans-Whipp, Kjeldsen, Toumbourou, & von Soest, 2019; Marcon et al., 2018; Staton et al., 1999). However, age is not a perfect measure of behavioral onset, especially when it concerns an individual decision about a behavior change, such as starting healthy eating and exercising. Moreover, the fact that we did not find significant differences between the age groups might indicate that age is not a good estimate of the onset of smoking behavior either. Unfortunately, not finding significant differences between the age groups does not allow us to make definite conclusions and recommendations. Thus, we encourage future research to measure the stage of behavioral development more directly as, for example, in Mayhew et al. (2000).

Moreover, as in many previous studies on the relationship between TP and multiple health behaviors (Adams and Nettle, 2009; Adams, 2012; Daugherty & Brase, 2010; Keough et al., 1999), smoking was only measured as a current smoking status. However, TP was shown to be associated with time of onset of substance use, including smoking (Wills, Sandy, & Yaeger, 2001). Moreover, smoking can be hard to quit because of addiction. Hall, Fong, and Meng (2014) showed that the relationship between TP quitting attempts was mediated though the intention to quit smoking. Thus we encourage that future research uses multiple measures of smoking behavior, including onset and quitting attempts.

Because of a large number of items measured in the questionnaire used for papers 1–3, the questionnaire was representative of the general adult Norwegian population based only on age, gender, and region, but not on other more specific study variables, such as smoking status. In our study, 27% of the respondents reported daily smoking. However, the proportion of daily smokers in the Norwegian population was estimated to be around 14% at the time of the data collection (Gartner et.al., 2017). According to the Norwegian Institute of Public Health (2018), about 30% of Norwegian adult population use tobacco in form of cigarettes or snus, thus we would like to encourage future research on the influence of time perspective on snus use. However, as discussed above, the perception of the health risk of snus use is not as pronounce as in the case of smoking. Thus, we suggest that the relationship between time perspective and snus use should be tested in a model including perceived health risk and perceived attitudes towards snus.

Due to resource limitations, this dissertation covers only a small portion of the mechanisms that influence individual time perspective and health behavior. This work did not include regulatory focus in the model, however some findings point to the fact that the

relationship between time perspective and health behavior might be mediated though the promotion regulatory focus. Thus, further studies on influence of regulatory focus on the relationship between time perspective and health behavior are encouraged. This study was performed on the Norwegian population; the individualistic western societies are known for accepting promotion orientation (Aaker & Lee, 2001; Elliot, Chirkov, Kim, & Sheldon, 2001). We encourage future research on the relationship of time perspective and health behaviors in other cultural contexts. If the relationship between time perspective and health behavior is indeed mediated via regulatory focus, we could expect a different relationship in collectivistic cultures where individuals tend to have prevention rather than promotion focus (Uskul et al., 2009). If the relationship between TP and health behaviors was moderated though the prevention regulatory focus, then we could expect that present-oriented people would try to avoid the costs and investments into their future health, whereas future-oriented people would avoid unhealthy behaviors that could have negative effect on their future health.

Furthermore, several of the models and findings of this work should be tested in other cultural contexts. Precisely, the future research of CFC-health questionnaire in different cultural contexts and languages is encouraged. Moreover, ZTPI-based temporal profiles were not found to be uniform though the cultural contexts (Boniwell et al., 2010; Cole et al., 2016; McKay et al., 2014; Worrel et al., 2015), so we call for the future studies of the temporal profiles based on both CFC and ZTPI in different cultures.

Due to recourse limitation and the lack of the previous studies on the topic, ZTPI was not included in Papers 3 and 4. We encourage future research to develop domain-specific ZTPI scales and compare their ability to predict intentions and behaviors from those domains with a

general ZTPI. Moreover, future research is encouraged to research the relationship between ZTPI and perceived self-continuity.

Another limitation of this work is that it did not include perceived barriers and benefits of health behaviors in the model. Each health behavior has a full spectrum of perceived befits and barriers/costs associated with it. Besides long-term health benefits and short-term costs, there are immediate benefits of healthy behaviors. For example, among the immediate perceived benefits of exercising are pleasure, mental alertness, improved muscle tone, social benefits in form of meeting new people and contacting friends (Brown, 2005). Likewise, unhealthy behaviors do not only cause immediate pleasure or satisfaction of the addiction drive, but also immediate feeling of regret and remorse. In the study by Fong et al. (2004) in four countries, around 90% of smokers experienced regret. Future research on the relationship between time perspective and particular health behaviors is encouraged to include perceived benefits and barriers to performing those behaviors in the model.

The result that time perspective was a significant predictor of smoking only in the younger group could indicate that the relationship between time perspective and health behaviors could be moderated by habit and/or addiction. In a meta-analysis, Gardner, Bruijn, and Lally (2011) emphasize that the role of habitual action is largely neglected in the health behavior models. Studying habit change, though challenging as habit cannot be manipulated on the short-term basis, is extremely important. Gardner et al. (2011) found that habit moderated the relationship between intention and health behavior. Habits were shown to cause the insensitivity to outcomes (Neal, Wood, Wu, & Kurlander, 2011). Research showed that habit influences the relationship between self-control and health behavior, however, forming beneficial habits can be crucial for goal attainment (see Wood (2017) for review).

On the other hand, bad habit and temptation inhibition as well as forming beneficial habits and the ability to prioritize long-term goals are dependent on self-regulation (see TPB by Ajzen and Madden (1986). Interestingly, time perspective constructs can reflect both motivation, i.e. being motivated by immediate versus distant outcomes, and self-regulation, i.e. the ability to suspend the undesired behavior, and advance goal-oriented behavior (Hall & Fong, 2007). Indeed, the items of the CFC and ZTPI questionnaires and the self-control scale (SCS) (Tangney, Baumeister, & Boone, 2004) are very similar. For example, "I am able to work effectively toward long-term goals" (SCS), "I refuse things that are bad for me" (SCS), "I do many things on the spur of the moment" (SCS), and "Often I engage in a particular behavior in order to achieve outcomes that may not result for many years" (CFC), "I make decisions on the spur of the moment" (ZPH). Future research on the discriminant validity between time perspective and self-control, as well as their interaction is encouraged.

Another important topic that was left outside the model tested in this work is emotions. As we mentioned above, the past dimensions of ZTPI reflect positive and negative emotions connected to individual's past. For example, emotions were shown to affect eating behavior (Leigh Gibson, 2006; Macht, 2008), a recent meta-analysis by Brewer, Defrank, and Gilkey (2016) revealed that anticipated regret predicted both health intentions and behavior. Sirois, Kitner, and Hirsch (2015) found that self-compassion was positively associated with healthy behaviors. In the future research it would be interesting to investigate whether the relationship between perceived connectedness to the future self and health behaviors is mediated by emotions, such as self-compassion.

Moreover, it is essential to consider the effect of emotions when developing health behavior intervention campaigns. Earlier research has established the association between affect-

related concepts and health behavior (Williams & Evans, 2014). For example, Hofmann and Fisher (2012) showed that feelings of guilt and pride can influence self-control. Furthermore, factors that influence health behavior initiation are not necessarily the same factors that are associated with health behavior maintenance (Rothman, 2000). For example, decision about behavior initiation can be influenced by favorable expectations about behavioral outcome, whereas the decision to maintain the behavior can depend on perceived satisfaction with received outcomes (Baldwin et al., 2006; Rothman, 2000; Williams et al., 2008).

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Part III. Papers.

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Individual differences in time perspective, age, and smoking behavior: A test of two present versus future conceptualizations

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ABSTRACT

We evaluated the discriminant validity of the present and future time perspective constructs used in the Consideration of Future Consequences scale (CFCS) and Zimbardo Time Perspective Inventory (ZTPI) and their concurrent validity in relation to smoking behavior. We also assessed the moderating effect of age on the association between time perspective and smoking behavior. We found that although they are closely related, the present and future time constructs used in the two scales are distinct from one another. In both models, the present time perspective, but not the future time perspective, was significantly linked to smoking. Moreover, we found that Zimbardo present fatalistic perspective (ZPF) was more strongly associated with smoking than consideration of immediate consequences (CFC-I). Both models had higher predictive power in the younger group than the older group. The practical implications of the findings are discussed.

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Introduction

Tobacco smoking is a recognized cause of reduced life expectancy. Half of all chronic smokers die prematurely, losing on average 10 years of life expectancy (Doll, Peto, Boreham, & Sutherland, 2004). Gram, Sandin, Braaten, Lund, and Weiderpass (2013) showed that 34% of mortality in middle-aged Norwegian women was due to smoking. There has been extensive research establishing connections between smoking and numerous health conditions, including cardiovascular disease (Ambrose & Barua, 2004) and various types of cancer (Gandini et al., 2008; Sasco, Secretan, & Straif, 2004).

Given the considerable health risk associated with smoking, programs that encourage smoking cessation are vital. Earlier research has established that a number of personality, motivational, and attitudinal variables are associated with smoking. Conscientiousness (Bogg & Roberts, 2004), perceived self-efficacy (Shiffman et al., 2000), and self-control (Muraven, 2010) are negatively related to smoking, whereas sensation seeking (Hwang & Park, 2015), impulsivity, and temporal discounting (Granö, Virtanen, Vahtera, Elovainio, & Kivimäki, 2004; Sheffer et al., 2014) have a positive association with smoking.

Time perspective (TP) or temporal orientation represents a stable individual feature to focus on the past, present, or future (Holman & Silver, 1998). TP influences cognitive processes such as the encoding, storing, and recall of events and the formation of expectations, goals, contingencies, and imaginative scenarios. Thus, TP has an effect on many important judgments, decisions, and actions (Zimbardo & Boyd, 1999). Researchers have previously established the links of time perspective to various health behaviors (Orbell & Kyriakaki, 2008; Zimbardo, Keough, & Boyd, 1997) and to smoking behavior in particular (Adams, 2012; Henson, Carey, Carey, & Maisto, 2006; Keough, Zimbardo, & Boyd, 1999).

Despite an increasing trend to apply a person-oriented approach to the study of time perspective (Cole, Andretta, & McKay, 2016; McKay, Andretta, Magee, & Worrell, 2014; Worrell, McKay, & Andretta, 2015) in a recent review of the extant research on TP, Joireman and King (2016) emphasized the importance of testing the similarities and differences between the present and future TPs of the two alternative TP scales, namely the Consideration of Future Consequences Scale (CFCS) (Joireman, Shaffer, Balliet, & Strathman, 2012) and Zimbardo Time Perspective Inventory (ZTPI) (Zimbardo & Boyd, 1999). In this study, we addressed that call for research by assessing the reliability and discriminant validity of the two TP constructs and comparing the extent to which the two theoretical approaches are able to explain self-reported smoking behavior. A number of earlier studies have explored the reliability and concurrent validity of CFCS and ZTPI (Perry et al., 2015), including in the context of health behavior (Crockett, Weinman, Hankins, & Marteau, 2009; Daugherty & Brase, 2010); however, the majority were based on the one-factor CFCS, whereas we used the two-dimensional CFC-14 scale: CFC-Immediate (CFC-I) and CFC-Future (CFC-F) developed by Joireman et al. (2012). Earlier research established that a two-factor model has a better fit than a one-factor model (Adams, 2012; Joireman, Balliet, Sprott, Spangenberg, & Schultz, 2008; McKay, Percy, & Cole, 2013). Moreover, a two-factor model helps to account for the fact that the present and future dimensions do not have to be mutually exclusive; for instance, individuals could care about both immediate and future consequences of their actions. Furthermore, these authors found that CFC-I and CFC-F could uniquely predict various health behaviors.

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Like other health behaviors, smoking involves an intertemporal choice: a choice between immediate alleviation of cravings for a smoke and the likely negative future consequences: cancer, reduced life quality, and premature death. This means that individual differences in TP may be an important factor in smoking behavior.

In health-related literature, present and future TPs are most widely used to predict health behavior (Fieulaine & Martinez, 2010). Present and future TPs reflect general preoccupation with the present and future, respectively. In our work, present TP is represented by a one-dimensional measure of consideration of immediate consequences (CFC-I) and two dimensions from ZTPI: Zimbardo present hedonistic perspective (ZPH) and Zimbardo present fatalistic perspective (ZPF). Future TP is represented by consideration of future consequences (CFC-F) and Zimbardo future perspective (ZF). We predicted that present TP would be positively associated with smoking, as present-oriented individuals may prioritize the alleviation of immediate cravings. In contrast, future TP was expected to be negatively associated with smoking because future-oriented individuals might focus on the future health risks associated with smoking.

Although a number of previous studies found an association between TP and smoking (Henson et al., 2006; Keough et al., 1999), others have not (Adams & White, 2009; Griva, Tseferidi, & Anagnostopoulos, 2015). Guthrie, Butler, Lessl, Ochi, and Ward (2014) suggested that the association between TP and health behaviors might be moderated by age. They found that TP was a stronger predictor of health behavior in young adults than in older people and suggested that this was because the onset of many health behaviors is in adolescence or young adulthood and so this is when active decisions about such behaviors are made. In older adults, these decisions may have been settled long ago, and the relevant behavior has become habitual. Guthrie et al. (2014) assessed the moderating effect of age by dividing the participants into three age groups: 18–24 years, 25–34 years, and 35 years and older. TP was only associated with health behaviors in the youngest group.

In the present work, we chose to use 35 years as the dividing point between our younger and older group. Our decision was based on several considerations. First, research shows that the survival curve for those who quit smoking before the age of 35 is similar to that for people who have never smoked (Doll et al., 2004). Second, by this age, most people have started a family and thus have other motivations for quitting smoking than their personal interests. Halpern and Warner (1993) found that the desire to set a good example to children is an important motivation for quitting smoking. Lund and Helgason (2005) reported that in Norway there has been an increase in awareness of the health risk that passive smoking poses to children. Furthermore, older people are more likely to be hard-core smokers than younger people; in other words, they tend to be more dependent (Emery, Gilpin, Ake, Farkas, & Pierce, 2000). Next, there could be differences in health risk awareness of smoking between younger and older individuals at the time of behavior onset. Lund, Lund, and Kvaavik (2011) reported a downward trend in cigarette smoking in Norway.

Based on the previous research and the reasons mentioned above, we hypothesized that the association between TP and smoking would be stronger in the younger group than in the older group.

Method

Participants and procedure

A reputable survey company was hired to collect data from a representative Norwegian population sample. A total number of 346 participants, 177 women and 169 men aged between 18 and 65 years (M = 42), answered an online questionnaire.

Measures

We assessed consideration of future consequences using the CFC-14 questionnaire (Joireman et al., 2012), that is, Strathman et al.'s (Strathman, Gleicher, Boninger, & Edwards, 1994) original CFC-12 scale with two additional future-oriented items. The present work used a short version of the ZTPI from Wakefield, Homewood, Taylor, Mahmut, and Meiser (2010) consisting of 5 items per dimension, 25 items in total. This scale contains 13 out of 15 questions used in the short version of ZTPI (SZPTI) examined and validated by Zhang, Howell, and Bowerman (2013) and McKay, Worrell, Temple, Perry, & Cole, (2014). To avoid question format effects (Schwarz, 1999; Tourangeau, Rips, & Rasinski, 2000), all items were rated on a 7-point Likert scale ranging from −3 = "strongly disagree" to +3 = "strongly agree."

Smoking behavior (SB) was a continuous variable assessed with one question: "On average, how many portions (i.e., number of cigarettes/pipes) per day have you smoked during the last month?" with responses being estimated using a 9-point scale where 1 = 0, 9 = 60 or more portions.

To estimate age, the participants were asked to state their age in years. For the group analysis, the participants were divided into two groups: 113 individuals aged 18–34 years in the younger group and 233 participants aged 35–65 years in the older group.

Data analysis

First, two confirmatory factor analyses (CFAs) were executed in AMOS.24. The first analysis included two CFCS factors: CFC-I and CFC-F. The second analysis included three ZTPI factors: ZPH, ZPF, and ZF. Next, the two path models with CFCS and ZTPI were estimated in AMOS. To test for a moderation effect, we performed multigroup structural equation analyses of the two models and a chi-square difference test to check for invariance of the models as whole and individual paths.

Results

Construct validation

The confirmatory factor analysis of the CFCS demonstrated a bad data fit. Three CFCS items with low factor loadings were removed from further analyses: CFC-I3: "My convenience is a big factor in the decisions I make or the actions I take"; CFC-F4: "I think it is important to take warnings about negative outcomes seriously even if the negative outcome will not

occur for many years"; and CFC-I7: "Since my day-to-day work has specific outcomes, it is more important to me than behavior that has distant outcomes." These items have previously resulted in low factor loadings (Joireman et al., 2012; Toepoel, 2010). The new model had a more satisfactory fit (Hu & Bentler, 1999): CMIN/*df* = 2.949, GFI = .942, CFI = .951, RMSEA = .075. During the CFA of the ZTPI model we removed one ZPH5 item with extremely low loading (R = .29). The item was: "I make decisions on the spur of the moment." The resulting model demonstrated good fit: CMIN/df = 1.976, GFI = .945, CFI = .951, RMSEA = .053. Table 1 presents composite reliability scores (CR) of the constructs and standardized CFA factor loadings for the items that were later used in path analyses. The composite reliability scores (CR) of the constructs were higher than .7, demonstrating that the construct measures were reliable (Hair, Anderson, Tatham, & Black, 1998).

Table 2 presents means, standard deviations, and correlations between the study variables. To interpret the effect sizes of correlation coefficients, we have used the guidelines suggested in Ferguson (2009). The recommended minimum practical effect (RMPE) is a coefficient of ≥.20, a coefficient of .50 is a threshold for a moderate effect size, and a coefficient of ≥ .80 represents a strong effect. Only two correlation coefficients reached the threshold of .50 for a moderate effect size. The correlation between CFC-I and CFC-F was negative (R = −.54), and the correlation between CFC-I and ZPF was positive (R = .62). Based on the rather moderate and low correlations between factors, we concluded that the constructs had satisfactory discriminant validity. However, we decided to perform a discriminant validity test for the constructs CFC-I and ZPF, demonstrating the highest correlation (*R* = .62). We used a procedure described by Bagozzi, Yi, and Phillips (1991). We compared a two-factor versus a one-factor model. The two-factor solution demonstrated a significantly better fit: CMIN/*df* = 2.081, CFI = .974, RMSEA = .056 for the two-factor model versus CMIN/*df* = 5.977, CFI = .877, RMSEA = .120 for the one-factor model; $\Delta\chi^2 = 130.633$, $\Delta df = 1$; $p < .001$.

SEM analyses

As a next step, we executed structural equation analyses of the two models in AMOS for three groups: total sample, younger, and older respondent groups. The models demonstrated a good data fit (Hu & Bentler, 1999): CMIN/*df* = 2.467, GFI = .919, CFI = .934, RMSEA = .046 for the CFCS-model, and CMIN/*df* = 1.916, GFI = .919, CFI = .924, RMSEA = .036 for the ZTPI model. Table 3 demonstrates the results for the CFCS and ZTPI models.

The results of the SEM test showed that only present TP was significantly related to smoking behavior, whereas the future TP was not associated with smoking behavior. Moreover, for the ZTPI model, only ZPF, and not ZPH, was related to smoking behavior. Common for both models was that the explanatory power of the models was higher for the younger (R^2 = .09 and .18) than for the older participants

Table 1. Standardized estimates from confirmatory factor analyses and composite reliability scores (CR) of the constructs. (a) CFCS model. (b) ZTPI model.

(a) CFCS Item (Joireman et al.'s CFC-14 scale item number)	CFA factor score (CR of the construct)
Consideration of immediate consequences (CFC-I)	(.84)
CFC-I1. I only act to satisfy immediate concerns, figuring the future will take care of itself (3).	.69
CFC-I2. My behavior is only influenced by the immediate (i.e., a matter of days or weeks) outcomes of my actions (4).	.54
CFC-I4. I generally ignore warnings about possible future problems because I think the problems will be resolved before they reach crisis level (9).	.75
CFC-I5. I think that sacrificing now is usually unnecessary since future outcomes can be dealt with at a later time (10).	.76
CFC-I6. I only act to satisfy immediate concerns, figuring that I will take care of future problems that may occur at a later date (11).	.87
Consideration of future consequences (CFC-F)	(.81)
CFC-F1. I consider how things might be in the future, and try to influence those things with my day to day behaviour (1).	.69
CFC-F2. Often I engage in a particular behavior in order to achieve outcomes that may not result for many years (2).	.61
CFC-F3. I am willing to sacrifice my immediate happiness or wellbeing in order to achieve future outcomes (6).	.55
CFC-F5. I think it is more important to perform a behavior with important distant consequences than a behavior with less important immediate consequences (8).	.77
CFC-F6. When I make a decision, I think about how it might affect me in the future (13).	.58
CFC-F7. My behavior is generally influenced by future consequences (14).	.65

(b) ZTPI Item (Original ZTPI item number, Wakefield et al's item number)	CFA factor score (CR of the construct)
Zimbardo present hedonistic (ZPH)	(.80)
ZPH1. I take risks to put excitement in my life (42, 20).	.81
ZPH2. Taking risks keeps my life from becoming boring (31, 14).	.85
ZPH3. It is important to put excitement in my life (26, 12).	.68
ZPH4. I do things impulsively (8,3).	.51
Zimbardo present fatalistic (ZPF)	(.73)
ZPF1. It doesn't make sense to worry about the future, since there is nothing that I can do about it anyway (39, 18).	.43
ZPF2. You can't really plan for the future because things change so much (37, 16).	.47
ZPF3. Often luck pays off better than hard work (53, 24).	.56
ZPF4. Since whatever will be, will be, it doesn't really matter what I do (14, 7).	.85
ZPF5. My life path is controlled by forces I cannot influence (38, 17).	.61
Zimbardo future (ZF)	(.76)
ZF1. I am able to resist temptations when I know that there is work to be done (45, 21).	.51
ZF2. I keep working at difficult uninteresting work if it will help me get ahead (51, 23).	.47
ZF3. I complete projects on time by making steady progress (40, 19).	.82
ZF4. When I want to achieve something, I set goals and consider specific means for reaching those goals (10, 4).	.76
ZF5. Meeting tomorrow's deadline and doing other necessary work comes before tonight's play (13, 6).	.56

Note. Fit indexes for Consideration of Future Consequences scale (CFCS): CMIN/*df* = 2.949, GFI = .942, CFI = .951, RMSEA = .075.
Fit indexes for Zimbardo Time Perspective Inventory (ZTPI): CMIN/*df* = 1.976, GFI = .945, CFI = .951, RMSEA = .053.

Table 2. Correlation matrix, means, and standard deviations of the constructs.

	Mean	SD	CFC-I	CFC-F	ZPH	ZPF	ZF	SB	Age
CFC-I	3.43	1.09	1.00						
CFC-F	4.43	.91	**−.54*** **	1.00					
ZPH	3.75	1.12	.24***	.02	1.00				
ZPF	3.43	1.08	**.62*** **	−.37***	.28***	1.00			
ZF	4.71	.96	−.22***	.44***	−.06	−.24***	1.00		
SB	1.99	1.86	.17***	−.10*	.03	.20***	.03	1.00	
Age	41.72	12.70	−.03	.00	−.14**	.01	.14**	.11**	1.00

Note: SD = standard deviation, CFC-I = consideration of immediate consequences, CFC-F = consideration of future consequences, ZPH = Zimbardo present hedonistic, ZPF = Zimbardo present fatalistic, ZF = Zimbardo future, SB = smoking behavior, *p < .1, **p < .05, ***p < .01. The coefficients that have reached the moderate effect size threshold of .50 (Ferguson, 2009) are bolded.

Table 3. The results of the SEM analyses for the CFCS and ZTPI models.

		Total	Younger group	Older group
Present	CFC-I → SB	.17**	.34**	.10
time	ZPH → SB	−.035	−.031	−.02
perspective	ZPF → SB	.23***	.45***	.14*
Future time	CFC-F → SB	−.01	.13	−.08
perspective	ZF → SB	.09	.15	.08

Note: CFC-I = consideration of immediate consequences, CFC-F = consideration of future consequences, ZPH = Zimbardo present hedonistic, ZPF = Zimbardo present fatalistic, ZF = Zimbardo future, SB = smoking behavior *p < .1, **p < .05, ***p < .01.

(R^2 = .02 and .02) for CFCS and ZTPI, respectively. The recommended minimum effect size for R^2 suggested by Ferguson (2009) is ≥ .04.

Invariance test for age moderation

To test for invariance at the model level, the chi-square from the model with all parameters allowed to vary across groups was compared to the chi-square from the fully constrained model.

Contrary to our expectations, the chi-square difference test indicated that the groups were different at the model level only at a 90% confidence interval for the CFCS model, p = .098. The results for the ZTPI model failed to reach a statistically significant level, p = .21. The path-by-path analysis for the models showed that none of the paths' chi-square differences were statistically significant.

Discussion

The present work contributes to theory development in several ways. First, we established the discriminant validity of the present and future time dimensions of the CFCS and ZTPI, as only two of the correlations reached the threshold of .50 for a moderate effect size (Ferguson, 2009). In line with previous research (McKay, Perry, Cole, & Worrell, 2017), there were meaningful significant correlations between the present/future time perspective variables across the scales. Consideration of immediate consequences (CFC-I) was positively correlated with two present TP variables, Zimbardo present fatalistic (ZPF) and Zimbardo present hedonistic (ZPH), and negatively associated with two future TP variables, consideration of future consequences (CFC-F) and Zimbardo future (ZF). Consideration of future consequences was positively correlated with Zimbardo future (ZF) and negatively associated with consideration of immediate consequences (CFC-I) and Zimbardo present fatalistic (ZPF); it did not have an association with Zimbardo present hedonistic (ZPH), however. The finding that there was a moderate correlation between consideration of immediate consequences (CFC-I) and Zimbardo present fatalistic (ZPF) (R = .62), whereas the correlation between CFC-I and Zimbardo present hedonistic (ZPH) was only above the acceptable minimum (R = .24), was unexpected, and requires further research.

Second, we estimated the concurrent validity of the two time perspective scales in relation to smoking behavior. Present time perspective constructs CFC-I and ZPF had a significant positive effect on SB, whereas ZPH had no effect. This finding supports Henson et al.'s (2006) suggestion that ZPF, rather than ZPH, predicts risk behaviors, including smoking. The results suggest that smoking behavior might be more successfully explained by lack of perceived control over one's own present and future, or inability to recognize the causal link between one's actions and the consequences of such actions rather than pleasure seeking. However, the future time perspective constructs, CFC-F and ZF, did not affect smoking behavior. Furthermore, the results are in line with the previous reports (Adams, 2012; Keough et al., 1999) that present time perspective predicts substance use, including smoking, whereas future time perspective is not a consistent predictor of substance abuse. These findings might suggest that individuals who prioritize immediate outcomes tend to smoke more; however, thinking about the future does not influence smoking behavior. In general, the ZTPI model was more effective in predicting smoking behavior in the younger group than the CFCS model, R^2 = .18 and .09, respectively.

Comparison of the age groups showed that both models were more successful at predicting smoking behavior in the younger group than in the older group (respectively, R^2 = .09 and .02 for CFCS and .18 and .02 for ZTPI). There are several possible explanations for this result, such as establishing a family and being motivated to quit smoking in order to set a good example for children (Halpern & Warner, 1993) and to reduce child exposure to tobacco smoking (Lund & Helgason, 2005), the higher level of nicotine addiction in older people (Emery et al., 2000), and differences in in health risk awareness of smoking between younger and older individuals at the time of behavior onset (Lund et al., 2011). The observed differences between the younger and older groups notwithstanding, the invariance test showed that the group differences were significant at the 90% confidence interval in case of the CFCS model, and not significant at the models level in the case of the ZTPI model. Despite the insignificant results of the invariance test on the model level, the findings point in the same direction as those of Guthrie et al. (2014). Thus, the moderating effect of age on the relationship between time perspective and smoking behavior can be an interesting topic for future research.

Limitations

The failure to obtain statistically significant results for the moderation test may be due to the very skewed distribution and limited variance in smoking behavior score: 254 out of 346 respondents were non-smokers. A general limitation of our work was the non-experimental cross-sectional design that limited us in concluding about causal relationships between

constructs. Another limitation was that all data were self-reports and could, therefore, have been subject to biases, such as social desirability. The rather low explanatory power of the model and small effect sizes could also be attributed to the fact that we were assessing the relationship between general personality factors and specific behaviors. Van Beek, Antonides, and Handgraaf (2013) have shown that behavior-specific personality measures have better predictive power. Thus, using behavior-specific measures of time perspective in future research may be considered.

Practical implications

First, our investigation of the relationship between CFCs and smoking behavior suggests that only consideration of immediate consequences had a positive relationship with smoking. Thus, the study might suggest that anti-smoking campaigns should prioritize reducing the immediate attractiveness of smoking rather than emphasizing the future health benefits of smoking cessation.

Second, the significant positive effect of Zimbardo Present Fatalistic on smoking behavior suggests that people who believe that their future is determined by some higher power rather than by their own decisions and actions are more likely to smoke. This suggests that anti-smoking initiatives could profitably target fatalistic beliefs and aim to increase smokers' perception that they are responsible for their own future.

Disclosure of potential conflicts of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

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Health and Disability

Present and future temporal profiles and their relationship to health intentions and behaviors: A test on a Norwegian general population sample

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We investigated the temporal profiles of a Norwegian general population sample and their relation to health behaviors and intentions. The profiles were based on variables from the present and future dimensions of the Zimbardo Time Perspective Inventory (ZTPI), the Consideration of Future Consequences Scale (CFCS), and the combination of both scales. The analysis revealed that there were only two stable clusters that corresponded to the present and the future profiles. Generally, CFCS-based present and future profiles were more effective at predicting health behaviors and intentions than ZTPI-based profiles. Profiles based on the CFCS variables were more predictive of eating behaviors. However, the profiles based on the combination of both CFCS and ZTPI were more predictive of smoking, exercising, and health intentions than the profiles based solely on the CFCS. The variation in walking was explained only by the profiles based on a combination of CFCS and ZTPI.

Key words: Temporal profiles, time perspective, time orientation, health behavior.

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INTRODUCTION

Health behavior has an intertemporal nature. It implies the choice between present and future, where a person invests time and effort in the present, or foregoes immediate gratification in order to obtain better health in the future. Therefore, numerous researchers use the concept of time perspective (TP) to explain health attitudes and intentions (Gick, 2014; Joireman, Shaffer, Balliet & Strathman, 2012; Sirois, 2004), as well as health behavior (Daugherty & Brase, 2010; Henson, Carey, Carey & Maisto, 2006; Keough, Zimbardo & Boyd, 1999; Orbell & Kyriakaki, 2008; Ouellette, Hessling, Gibbons, Reis-Bergan & Gerrard, 2005).

The two often used operationalizations of TP are the Consideration of Future Consequences Scale (CFCS) (Joireman *et al*., 2012; Strathman, Gleicher, Boninger & Edwards, 1994) and the Zimbardo Time Perspective Inventory (ZTPI) (Zimbardo & Boyd, 1999). Consideration of Future Consequences (CFC) is defined as "the extent to which individuals consider the potential distant outcomes of their current behaviors and the extent to which they are influenced by these potential outcomes" (Strathman *et al*., 1994, p. 743). Later, a two factor CFC-14 model was developed by Joireman *et al*., 2012, with CFC-immediate (CFC-I) and CFC-future (CFC-F), measuring individual preoccupation with immediate and future consequences respectively. The Zimbardo Time Perspective Inventory (ZTPI) (Zimbardo & Boyd, 1999) measures a broader concept of TP reflecting a general focus on past, present, or future. ZTPI includes two past factors: past-positive (ZPP) and past-negative (ZPN) reflecting positive or negative memories of the past respectively, in addition to two present factors: pleasure-seeking and risk-taking present-hedonistic (ZPH), present-fatalistic (ZPF) demonstrating a fatalistic attitude and a lack of control over one's future, and one future factor (ZF) reflecting a focus on future goals.

Earlier research shows that CFCS and ZTPI measure related, but not mutually exclusive, constructs (Crockett, Weinman, Hankins & Marteau, 2009; Daugherty & Brase, 2010; McKay, Perry, Cole & Worrell, 2018), thus they add extra dimensions to time perspective. In a recent review article, Joireman and King (2016) encouraged future research on similarities and differences between the present and future time perspective constructs of ZTPI (Zimbardo & Boyd, 1999) and the CFCS (Strathman *et al*., 1994). Our work addresses this call by comparing ZTPI and CFCS-based present and future temporal profiles. We chose to include only the present and future dimensions of ZTPI for the sake of comparison with CFCS that does not have the past dimension.

Most studies of the relationship between time perspective and health behavior are based on a variable-centered (or attribute-centered) approach, in which individuals are assessed along multiple dimensions summarizing stable individual differences in their cognitive, affective, or behavioral focus on the present or future (Adams, 2012; Daugherty & Brase, 2010). Naturally, on a variable level, consideration of immediate consequences and present time perspective are positively associated with unhealthy behaviors, and negatively linked to healthy behaviors. Accordingly, consideration of future consequences and future time perspective are often positively linked to healthy behaviors and negatively related to unhealthy behaviors (Adams & Nettle, 2009; Joireman *et al*., 2012).

In contrast, there has been less emphasis on the ways in which time perspectives are organized within individuals. Individuals have multiple traits, and how those traits are

configured within individuals has been studied on general personality traits of the NEO Personality Inventory, or other instruments, as different "personality types" for decades (Donnellan & Robins, 2010; Kinnunen, Feldt, Kokko *et al*., 2012). Recently, this approach has been adopted to identify individual temporal profiles (Cole, Andretta & McKay, 2016; McKay, Andretta, Magee & Worrell, 2014; Worrell, McKay & Andretta, 2015).

Unlike the variable-centered perspective that considers relationships between separate TP dimensions and certain health behaviors, the person-oriented approach helps to account for the fact that individuals hold all of the time perspectives that simultaneously form their temporal profile. Zimbardo and Boyd (1999) suggested that TP as a multidimensional construct, could be a better predictor of behavior. The authors have also suggested the "balanced time perspective" that allows individuals to switch between time TPs depending on the situation could be "most psychologically and physically healthy for individuals and optimal for societal functioning" (Zimbardo & Boyd, 1999, p. 1295).

Chapman, Duberstein, and Lyness (2007) emphasized the importance of cross-validation of personality profiles as, though they cannot be directly observed, they should occur regularly across different samples. Similar logic can be applied to temporal profiles. The research on the temporal profiles is rather recent, dating back to Boniwell, Osin, Linley and Ivanchenko (2010) who were among the first to operationalize Zimbardo and Boyd's idea of TP as a multidimensional construct and balanced time perspective. By means of cluster analysis, they established subgroups of individuals sharing similar score patterns on ZTPI variables. Though the temporal profiles that emerged in the previous studies were not uniform in their nature, all the studies found at least present and future profiles (Boniwell *et al*., 2010; Cole *et al*., 2016; McKay *et al*., 2014; Worrel *et al*., 2015).

The first objective of this paper was to cross-validate personality profiles identified based on the variables from the present and future dimensions of the two most often used TP scales – CFCS and ZTPI – in a Norwegian context. The paper answers the call of Joireman and King (2016) with regard to comparing present and future dimensions of CFCS and ZTPI. This work is, to our knowledge, the first to test temporal cluster replicability for different time perspective scales. Since health behavior is characterized by intertemporal choice between immediate and long-term benefits, most of the studies on the topic of influence of time perspective on health behavior involve only the present and future dimensions of time perspective (Crockett *et al*., 2009; Daugherty & Brase, 2010; Henson *et al*., 2006). With that in mind, and for the sake of comparison with CFCS which does not have the past dimension, we chose not to include the past dimension of ZTPI in our analysis and focused on the present and future dimensions. However, there exists research evidence of the connection between past time perspective and health behavior (Hamilton, Kives, Micevski & Grace, 2003); thus, further research on this topic is encouraged. Based on the previous research, we expected to distinguish present and future profiles. Moreover, a balanced (Boniwell *et al*., 2010; McKay *et al*., 2014; Worrel *et al*., 2015) or an ambivalent profile (Cole *et al*., 2016) could have emerged. In our case, we expected that a balanced profile would be characterized by moderate to high values of ZPH and ZF and low values of ZPF, whereas an ambivalent profile would be represented by moderate scores on all tested dimensions (Boyd & Zimbardo, 2005).

Our second goal was to test whether the members of particular temporal profiles would be more predisposed to various healthy and unhealthy behaviors, or have higher intentions to take care of their future health. Furthermore, as CFCS and ZTPI variables are not mutually exclusive, we tested whether the profiles identified on the basis of the combination of CFCS and ZTPI variables would be more predictive of health behaviors and intentions.

The previous studies that used the variable-centered approach have established the connection between TP and health behavior. For instance, Adams (2012) showed that high CFC-I is linked to smoking status and a higher BMI index, and McKay, Percy and Cole (2013) found a significant negative relation between CFC-F and problematic drinking behavior. Zimbardo and Boyd (1999) found a positive association between ZPH and alcohol use, and between ZPF and the number of sex partners. Daugherty and Brase (2010) reported positive correlations between ZPH, ZPF, and alcohol and drug use, and a negative relationship to safety belt use and breakfast consumption, whereas there was a significant positive correlation between ZF and physical exercise, breakfast consumption, safety belt and sunscreen use, and a negative association with alcohol and drug use. Zimbardo and Boyd (1999) reported that high ZF people were more likely to prefer nutrition to taste in selecting food. In Barnett, Spruijt-Metz, Unger *et al*. (2013) ZF was negatively related to marijuana, and hard drug use.

Concerning the person-oriented perspective, Cole *et al*. (2016) discovered that the respondents from the present profile most often reported hazardous drinking behavior, followed by the individuals with the ambivalent profile, then future-past negative and future past-positive. McKay *et al*. (2014) reported that there was a greater portion of abstainers in the future and balanced profiles. However, individuals with the future but not balanced profile were least at risk of problematic drinking. In light of previous research, we expected that the individuals with the future profile would have more healthy and less unhealthy behaviors, and have a higher score on health intentions than the individuals with the present profile. The present work was the first to test whether CFCS-based or ZTPI+CFCS-based clusters would be more predictive of health intention and behaviors than ZTPI-based clusters.

METHODS

Participants

A reputable survey company was hired to collect data from a representative Norwegian population sample. A total number of 494 participants, 258 women and 236 men, aged between 18 and 65 (mean = 40), answered an online questionnaire. The questionnaire was translated from English into Norwegian. Three native Norwegian speakers were asked to independently translate the questionnaire. The translations were compared, and the final variant was composed and approved by a fourth native speaker, and a professional linguist and translator.

Measures

The present work used a short version of ZTPI from Wakefield, Homewood, Taylor, Mahmut, and Meiser (2010) consisting of 5 items per dimension. All items were rated on a seven-point Likert scale ranging from –3 = "strongly disagree" to +3 = "strongly agree."

We assessed consideration of future consequences using the CFC-14 questionnaire (Joireman *et al*., 2012), that is the original CFC-12 scale by Strathman *et al*. (1994) with two additional future-oriented items. All items were rated on a seven-point Likert scale ranging from –3 = "strongly disagree" to +3 = "strongly agree."

Health intentions were measured with 6 items asking whether individuals were planning/ expected/ wanted to take care of their health in one and 20 years. All items were rated on a seven-point Likert scale ranging from –3 = "strongly disagree" to +3 = "strongly agree."

Smoking behavior (SB) was a continuous variable assessed with one question: "On average, how many portions (i.e., number of cigarettes/pipes) per day have you smoked during the last month?" with responses being estimated using a nine-point scale where 1 = 0, 9 = 60 or more portions.

Unhealthy eating was represented by three variables: eating cakes, unhealthy (sweet/salty) snacks, and drinking beverages with high sugar content. The items were measured on a nine-point scale ranging from 1 = several times per day, 9 = never.

Healthy eating was represented by two variables: eating fruit and eating vegetables. The items were measured on a nine-point scale ranging from 1 = several times per day, 9 = never.

The two physical activity variables included were walking and exercising status. The items were measured on a seven-point scale ranging from 1 = every day, 7 = never.

The scores on healthy eating, unhealthy eating, and physical activity were reversed for the analysis so that the higher score would represent a higher behavior frequency.

Analytical methods and procedures

First, we performed confirmatory factor analyses on ZTPI and CFCS with the help of SPSS AMOS 24 and removed items with low factor loadings and high cross loadings. Then, an average value of each temporal variable was calculated. Next, we identified temporal profiles in the sample by performing cluster analyses ZTPI, CFCS and ZTPI+CFCS as base variables in SPSS 24 in accordance with the following procedure. First, we executed hierarchical cluster analyses, Ward's method, in order to identify the number of clusters and initial cluster centroids. Then, we used K-means cluster analyses with a simple Euclidean distance similarity measure to fine-tune our cluster solution. The input variables were standardized prior to analysis (Hair, Black, Babin & Anderson, 2014). In Clatworthy, Hankins, Buick, Weinman and Horne (2007) this method was shown to perform best for large sample sizes (N > 300). In order to validate the cluster solutions, the sample was randomly split in half, and a cluster analysis of each half was performed, and the results of these analyses were compared. Another way to validate the cluster solution is to show its value to the field of study (Clatworthy *et al*., 2007). Through a number of *t*-tests performed in SPSS, we established cluster differences for various health behavior variables. To estimate effect size, Cohen's *d* was calculated (Cohen, 1992).

RESULTS

The factor analyses revealed that ZPH5 item "I make decisions on the spur of the moment," CFC-I3: "My convenience is a big factor in the decisions I make or the actions I take," and CFC-I7: "Since my day-to-day work has specific outcomes, it is more important to me than behavior that has distant outcomes" had very low factor loadings, r = 0.26, 0.32, and 0.35 respectively. The two CFC-I items have previously demonstrated low factor loadings (Joireman *et al*., 2012; Toepoel, 2010). ZPH5, CFC-I3 and CFC-I7 were removed from the models. The fit idexes for initial models were CMIN/df = 4.209, GFI = 0.908, CFI = 0.871, RMSEA = 0.081 for ZTPI and CMIN/df = 5.293, GFI = 0.899, CFI = 0.885, RMSEA = 0.093 for CFCS. The trimmed models demonstrated better data fit (Hu & Bentler, 1999): CMIN/df = 2.811, GFI = 0.944, CFI = 0.933, RMSEA = 0.061 for ZTPI and CMIN/df = 4.451, GFI = 0.930, CFI = 0.932, RMSEA = 0.084 for CFCS than initial models. The constructs with the remaining items demonstrated good reliability (Hair *et al*., 2014) with the following CR scores: 0.81 for ZPH, 0.73 for ZPF, 0.77 for ZF, 0.84 for CFC-I, and 0.84 for CFC-F. Correlations between study variables are presented in Table 1. Most of the correlations between CFCS and ZTPI are meaningful and significant; however, only the correlation between ZPF and CFC-I reaches the moderate threshold (r = 0.52) (Ferguson, 2009). The results provide extra evidence that ZTPI and CFCS operationalize similar, yet different constructs.

Cluster solutions

First, we performed three hierarchical cluster analyses, Ward's method: with only ZTPI variables, with only CFCS variables, and with the combination of ZTPI and CFCS variables as a base for clustering. The inspection of the agglomeration coefficients and the dendrograms (Hair *et al*., 2014) revealed that the optimal cluster solution in all cases could be a 2-cluster model. The cluster centres that resulted from the hierarchical analysis were used as initial cluster centroids for the subsequent K-means analyses. The results of this analysis are summarized in Fig. 1.

As we can see from the analyses, the two clusters that emerged in all three analyses can be characterized as present and future profiles, with the first cluster scoring high on all present variables and low on all future variables, and the second cluster scoring high on future variables and low on present variables. The amount of respondents with the present profile was 60.3%, 63.4%, and 66.4% for ZTPI-, CFCS-, and ZTPI+CFCS-based clusters, respectively. Chi-square tests revealed no differences in gender distribution between the present and future profiles in all three cases.

In order to validate the cluster solutions, we split the sample in half randomly and performed cluster analyses in both halves. The clusters found in both halves were similar to the clusters that resulted from the full sample. We also tested three-cluster solutions, but the clusters were not stable as they were different in two randomly split halves of the sample.

Table 1. *Pearson correlations between study variables*

	Mean	SD	CR	1	2	3	4	5	6	7	8	9	10	11	12	13
1. ZPH	3.84	1.15	0.81	1.00												
2. ZPF	3.44	1.09	0.73	0.21**	1.00											
3. ZF	4.70	.95	0.77	0.00	–0.10*	1.00										
4 CFC-I	3.48	1.12	0.84	0.26**	0.52**	–0.22**	1.00									
5 CFC-F	4.53	0.92	0.84	0.02	–0.24**	0.46**	–0.35**	1.00								
6. Smoking	2.02	1.84		0.03	0.12**	0.00	0.16**	–0.08	1.00							
7. Unhealthy cakes	3.43	1.45		0.02	0.06	–0.05	0.04	–0.02	0.08	1.00						
8. Unhealthy drinks	3.82	2.17		0.01	0.06	–0.07	0.17**	–0.07	0.12**	0.25**	1.00					
9. Healthy vegetables	6.76	1.71		0.07	–0.08	0.16**	–0.18**	0.16**	–0.15**	0.13**	–0.22**	1.00				
10. Healthy fruit	6.41	1.93		0.03	0.00	0.09*	–0.09*	0.13**	–0.09	0.18**	–0.06	0.62**	1.00			
11. Walking	4.88	1.63		0.08	–0.08	0.12**	–0.06	0.10*	–0.03	0.05	0.07	0.29**	0.29**	1.00		
12. Exercising	3.94	1.74		0.10*	–0.11*	0.04	–0.12*	0.17**	–0.16**	0.00	–0.05	0.15**	0.19**	0.32**	1.00	
13. Health intentions	5.55	1.19		–0.01	–0.06	0.08	–0.07	0.11*	–0.04	–0.02	–0.08	0.04	0.03	0.02	0.10*	1.00

Notes: SD = standard deviation, CR = composite reliability, ZPH = Zimbardo present hedonistic, ZPF = Zimbardo present fatalistic, ZF = Zimbardo future, CFC-I = consideration of immediate consequences, CFC-F = consideration of future consequences. **Correlation is significant at the 0.01 level. *Correlation is significant at the 0.05 level.

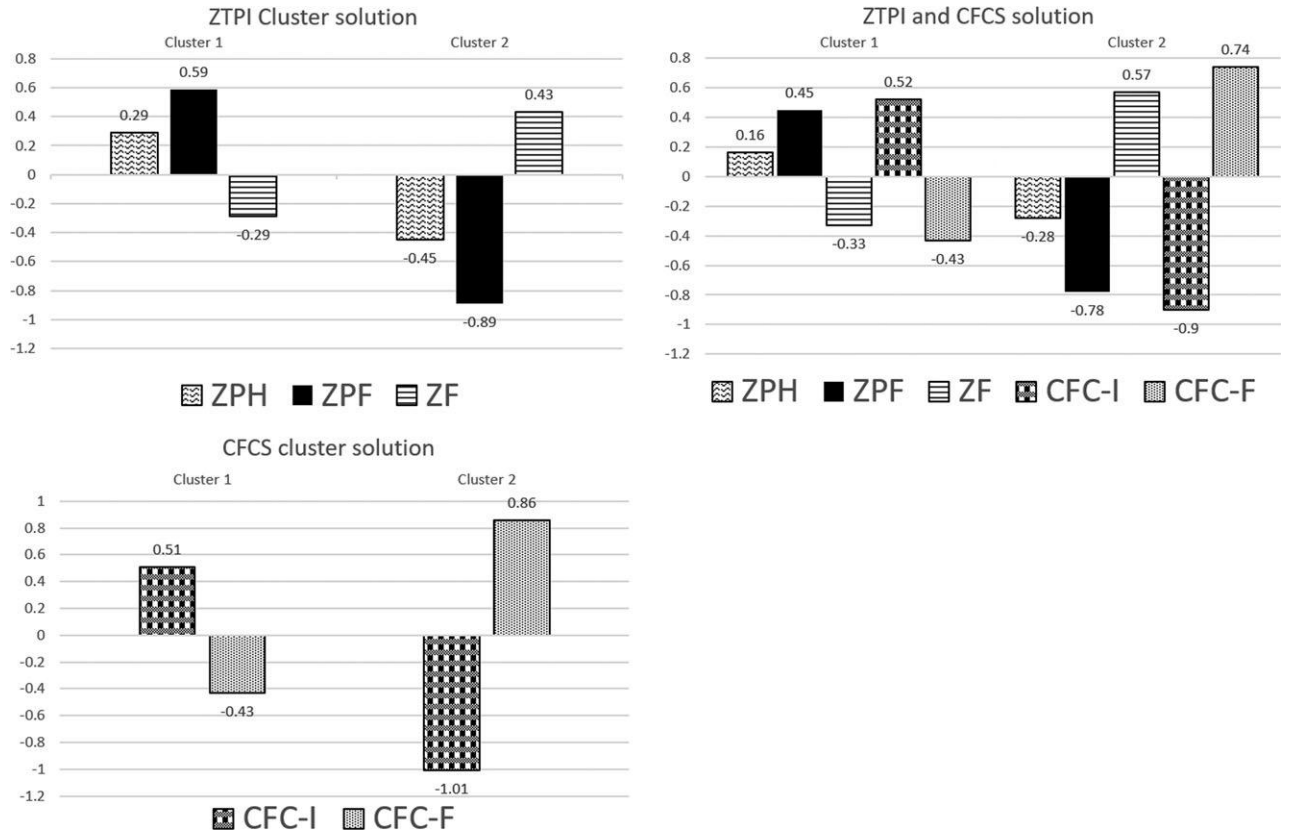

Fig. 1. Standardised cluster means of temporal profiles based on ZTPI, CFCS, and combined ZTPI and CFCS variables.
Notes: K-means analysis, K = 2. Cluster 1 n = 298 (60.3%), cluster 2 n = 196 (39.7%). ZTPI = Zimbardo Time Perspective Inventory, CFCS = Consideration of Future Consequences Scale, ZPH = Zimbardo present hedonistic, ZPF = Zimbardo present fatalistic, ZF = Zimbardo future, CFC-I = consideration of immediate consequences, CFC-F = consideration of future consequences.

Predicting health behavior

Generally, the individuals with the Present profile reported less healthy behaviors and scored lower on health intentions than the individuals in the Future profile. As presented in Table 1, the profiles divided only based on ZTPI variables did not differ significantly on most health behaviors and intentions except for

exercising (t = –2.17) and smoking (t = 1.97). The profiles identified based on CFCS variables differed significantly on smoking (t = 3.74), unhealthy drinks (t = 3.48), healthy vegetable (t = –4.71) and fruit eating (t = –2.18), and exercising (t = –2.35). The profiles divided based on the clustering variables from both ZTPI and CFCS differed significantly on smoking (t = 3.79), unhealthy drinks (t = 1.93), vegetable consumption (t = –3.26), walking (t = –2.51), and exercising (t = –3.40). The Cohen's d coefficients are reported in Table 2. Effect size of statistically significant differences was between 0.20 (small) and 0.50 (medium) (Cohen, 1992). In the case of healthy and unhealthy eating, the profiles identified on the basis of ZTPI+CFCS variables were less different than the profiles established on the basis of CFCS only based profiles (t = 1.93, –3.26, –1.65 versus t = 3.48, –4.71, –2.18 respectively). However, in the case of smoking, exercising, and health intentions, ZTPI + CFCS based profiles were more different than CFCS based profiles (t = 3.79, –3.40, –3.83 versus t = 3.74, –2.53, –2.08 respectively). Differences in walking behavior were only significant for ZTPI+CFCS-based profiles.

Table 2. *The results of T–tests of ZTPI, CFCS, and ZTPI + CFCS based clusters*

Dependent variables	Mean (SD)		*t*-test	
Health behavior	Present profile	Future profile	t(p)	Cohen's *d*
Smoking				
ZTPI based	2.15 (1.91)	1.83 (1.71)	1.97(0.05)	0.19
CFCS based	2.22 (1.99)	1.63 (1.45)	3.74(0.00)	0.36
ZTPI + CFCS based	2.24 (2.00)	1.65 (1.46)	3.79(0.00)	0.35
Unhealthy cakes				
ZTPI based	3.51 (1.55)	3.32 (1.29)	1.51(0.13)	0.14
CFCS based	3.49 (1.49)	3.32 (1.36)	1.28(0.20)	0.13
ZTPI + CFCS based	3.52(1.52)	3.29 (1.32)	1.77(0.08)	0.17
Unhealthy drinks				
ZTPI based	3.91 (2.18)	3.70 (2.16)	1.04(0.30)	0.10
CFCS based	4.05 (2.25)	3.37 (1.93)	3.48(0.00)	0.36
ZTPI + CFCS based	3.96(2.21)	3.58 (2.09)	1.93(0.05)	0.19
Healthy vegetables				
ZTPI based	6.65 (1.76)	6.93 (1.61)	−1.79(0.08)	−0.17
CFCS based	6.52 (1.76)	7.23 (1.49)	−4.71(0.00)	−0.48
ZTPI + CFCS based	6.58 (1.77)	7.08 (1.54)	−3.26(0.00)	−0.32
Healthy fruit				
ZTPI based	6.36 (1.90)	6.49 (1.98)	−0.76(0.45)	−0.08
CFCS based	6.28 (1.91)	6.68 (1.95)	−2.18(0.03)	−0.24
ZTPI + CFCS based	6.30 (1.90)	6.60 (1.97)	−1.65(0.10)	−0.17
Walking				
ZTPI based	4.78 (1.62)	5.05 (1.63)	−1.78(0.08)	−0.18
CFCS based	4.80 (1.56)	5.04 (1.75)	−1.47(0.14)	−0.17
ZTPI + CFCS based	4.74 (1.61)	5.13 (1.65)	−2.51(0.01)	−0.26
Exercising				
ZTPI based	3.80 (1.77)	4.14 (1.69)	−2.17(0.03)	−0.21
CFCS based	3.80 (1.75)	4.21 (1.71)	−2.53(0.01)	−0.28
ZTPI + CFCS based	3.74 (1.77)	4.28 (1.65)	−3.40(0.00)	−0.34
Health intentions				
ZTPI based	5.47 (1.22)	5.67 (1.14)	−1.83(0.07)	−0.18
CFCS based	5.47 (1.21)	5.70 (1.14)	−2.08(0.04)	−0.22
ZTPI + CFCS based	5.40 (1.23)	5.80 (1.07)	−3.83(0.00)	−0.37

Notes: ZTPI = Zimbardo Time Perspective Inventory, CFCS = Consideration of Future Consequences Scale, SD = standard deviation. Results of the *t*-test, equal variances not assumed.

DISCUSSION

The present work contributed to the existing body of knowledge in several ways. First, we tested the replicability of the temporal profiles based on different TP scales. While previous studies used ZTPI variables as a base for creating temporal profiles, our study was the first to incorporate CFCS in addition to ZTPI-based profiles. The three cluster analyses, that is, with present and future dimensions of ZTPI, CFCS and with the combination of ZTPI and CFCS variables as a base, resulted in a similar two-cluster solution. Similar to the earlier studies (Boniwell *et al*., 2010; Cole *et al*., 2016; McKay *et al*., 2014; Worrel *et al*., 2015), we found present and future profiles. The present profile was characterized by moderately high present hedonistic, present fatalistic, and consideration of immediate consequences and low Zimbardo future time perspective and consideration of future consequences. The individuals in the future profile scored above average on Zimbardo future time perspective and consideration of future consequences, and below average on present hedonistic, present fatalistic, and consideration of immediate consequences. Interestingly, present fatalistic contributed more than present hedonistic to the profiles. This could be partly explained by the fact that present hedonistic had much lower correlation with both CFCS variables compared to present fatalistic. Daugherty and Brase (2010) have also reported a higher correlation between ZPF and CFCS than ZPH and CFCS. A higher role of present fatalistic in the profile distinction could also explain why ZTPI-only based profiles could explain variation in smoking behavior, but not eating behavior (Henson *et al*., 2006).

We did not find a cluster that could represent a balanced (Boniwell *et al*., 2010; McKay *et al*., 2014; Worrel *et al*., 2015) or an ambivalent (Cole *et al*., 2016) temporal profile in the Norwegian context. Although our study incorporated only present and future TP variables, the balanced profile could possibly have been characterized by relatively high CFC-I, CFC-F and ZPH, and low ZPF (Boyd & Zimbardo, 2005), whereas individuals in the ambivalent profile could have scored average on all dimensions. The validation tests showed that the two-cluster solution was stable and replicable in randomly divided samples, whereas the three-cluster solution could not be replicated in the split samples.

Second, the study revealed which variables contribute to identifying the clusters of individuals that would differ significantly in relation to health behaviors and intentions. The present and future profiles identified based on CFCS variables were more predictive of health behaviors and intentions than ZTPI-based profiles that were not significantly different on most of health behaviors and intentions. CFCS-based profiles differed most on eating habits, whereas individuals from ZTPI+CFCS-based profiles differed most on smoking, physical activity, and health intentions. Differences in walking behavior were only significant for ZTPI+CFCS-based profiles. Thus, the present study demonstrates that ZTPI+CFCS-based profiles might be superior to only CFCS-based profiles when predicting most health behaviors and intentions, whereas CFCS-based profiles might be more useful when predicting eating behavior.

Though the earlier research has found significant relationships between different time perspectives and health behavior on a

variable level (Daugherty & Brase, 2010; Henson *et al*., 2006; Orbell & Kyriakaki, 2008), the results of the present work might suggest that the person-oriented approach could contribute an additional insight into individual time perspective. ZTPI and CFCS variables are not mutually exclusive, and, using both of them as clustering variables at the same time, accounts for the fact that individuals have these time perspectives simultaneously. Further, we would like to encourage future research that would compare the profiles based on ZTPI and the scales which include the past, present and future dimensions. Specifically, these scales are the Adolescent Time Attitude Scale (Worrell, Mello & Buhl, 2013) and the Temporal Focus Scale (Shipp, Edwards & Lambert, 2009).

The general limitation of the present study is its non-experimental design that prevents us from drawing conclusions about causality. Thus, we encourage future research on the influence of membership in TP segments on health attitudes and behavior to use an experimental design. Another limitation is that we used a shortened version of the ZTPI scale, thus we encourage future research to use the full ZTPI. Moreover, self-report measures of health behavior could be susceptible to social desirability and social approval biases (Paul, Rhodes, Kramer, Baer & Rumpler, 2005). Nevertheless, behavior frequency questionnaires remain commonly used for accessing habitual behaviors when establishing links between time perspectives and health behavior (Hall & Fong, 2003; Henson *et al*., 2006; McKay *et al*., 2013; Strathman *et al*., 1994).

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article:

Supplement 1. The results of the confirmatory factor analyses of the full ZTPI and CFCS scales (past, present and future dimensions included).

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Consideration of immediate and future consequences, perceived change in the future self, and health behavior

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ABSTRACT

The present study investigated the link between consideration of immediate and future consequences (CFC-I and CFC-F), and perceived change in the future self (PCFS) to healthy and unhealthy behaviors. Furthermore, we explored the moderation effect of PCFS on the relationship between CFC-I and CFC-F and health behaviors. We observed that CFC-I was linked to unhealthy behaviors, whereas CFC-F was associated with healthy behaviors. PCFS had a direct negative effect on healthy behaviors, and as a moderator, it strengthened the positive effect of CFC-I and dampened the negative effect of CFC-F on unhealthy behaviors. Implications for health communication are discussed.

KEYWORDS

exercise; future self-continuity; healthy eating; intertemporal choice; moderation; perceived connectedness; smoking; temporal discounting

Introduction

The pattern of health behavior is composed of many small decisions we make on a daily basis, such as the food we chose for breakfast today, whether we decide to go for a walk or lie on the sofa in the evening, or how many drinks we chose to have at the party last weekend. However, in many instances, individuals face the consequences of following their immediate desires much further in the future. Therefore, we can say that health behavior is an intertemporal choice (i.e., a "decision in which the timing of costs and benefits is spread over time"; Loewenstein & Thaler, 1989, p. 181).

As a rule, people prefer to get a reward sooner than later; such a tendency is called *time preference* (Frederick, Loewenstein, & O'Donoghue, 2002). As a result, the value of costs and benefits decreases over time (Loewenstein & Prelec, 1992). Thus, the true conflict between sooner and later options can only occur when an individual chooses between a smaller sooner and a larger later option (i.e., when there is a bonus for postponing a reward). In the case of health behavior, the small present rewards of

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unhealthy behavior or costs of healthy behavior are outweighed by a much larger health impact in the long run. The tradeoff between satisfying immediate desires and attaining future benefits has been studied in the area of education (Volder & Lens, 1982), environmental behavior (Milfont, Wilson, & Diniz, 2012), consumer behavior (Verplanken & Sato, 2011), saving behavior (Ersner-Hershfield, Wimmer, & Knutson, 2009), ethical behavior (Ersner-Hershfield, Cohen, & Thompson, 2012), and health behavior (Zimbardo & Boyd, 1999).

The present work aims to expand our understanding of the underlying mechanisms of health behavior choices. This article addresses two constructs that could potentially influence health behavior on a personal level: consideration of future consequences (CFC) and perceived connectedness/change in the future self (PCFS). The first objective of the present research was to provide a further insight into the relationship between time perspective and health behaviors. The study focused on the link of the two dimensions of CFC, consideration of immediate consequences (CFC-I) and consideration of future consequences (CFC-F), to smoking, healthy and unhealthy eating, and physical activity. We included both healthy and unhealthy behaviors in our research in order to test whether CFC-I and CFC-F could potentially differentially predict these categories of health behavior. Moreover, previous studies show that healthy and unhealthy behaviors are conceptualized differently (Povey, Conner, Sparks, James, & Shepherd, 1998) and have different responses to intervention (Adriaanse, Vinkers, Ridder, Hox, & Wit, 2011). As a second contribution to the existing theory of health behavior, the study explored the effects of perceived connectedness/change in the future self on health behaviors and its moderating effect on the relationships between CFC-factors and health behaviors.

Consideration of future consequences

CFC is "the extent to which individuals consider the potential distant outcomes of their current behaviors and the extent to which they are influenced by these potential outcomes" (Strathman, Gleicher, Boninger, & Edwards, 1994, p. 743). Low CFC people tend to focus more on their immediate versus their future needs. In contrast, those high in CFC consider the future implications of their behavior.

A series of studies presents evidence that high CFC is positively associated with personality traits related to self-control, including conscientiousness and delay of gratification, as well as long-term thinking and future-oriented behavior. For instance, Joireman, Lasane, Bennett, Richards, and Solaimani (2001) found that higher CFC is associated with stronger proenvironmental intentions, greater involvement in proenvironmental

behavior, and a stronger belief in the personal, social and biospheric consequences of environmental conditions. Sirois (2014) discovered a significant correlation between low CFC and procrastination. Peters, Joireman, and Ridgway (2005) showed that higher CFC is associated with higher school grades, whereas lower CFC is related to the tendency to miss classes due to oversleeping. Ouellette, Hessling, Gibbons, Reis-Bergan, and Gerrard (2005) presented an association between high CFC and a higher level of exercise behavior.

Later research has shown that a two-dimensional model of CFC with consideration of immediate and future consequences could contribute to a more accurate description of reality, as the present and future dimensions do not have to be mutually exclusive, as some people could potentially be equally concerned about immediate and future consequences of their actions. Furthermore, there is evidence that a two-factor CFC model demonstrates a better data fit (Adams, 2012; Joireman, Balliet, Sprott, Spangenberg, & Schultz, 2008; McKay, Percy, & Cole, 2013; Toepoel, 2010). CFC-I describes a general preoccupation with immediate outcomes whereas CFC-F illustrates a preoccupation with future outcomes of one's actions. The existing research provides mixed results as to which factor is predictive of intertemporal choice and health behavior. Joireman et al. (2008) found an association of high levels of CFC-I with lower self-control. Rappange, Brouwer, Job, and Van Exel (2009) demonstrated a significant correlation between two factors of the CFC model and temporal discounting. Adams (2012) showed that high CFC-I is associated with smoking status and a higher BMI index. On the other hand, McKay et al. (2013) found a significant correlation only between CFC-F and problematic drinking behavior. Thus, the first objective of our study was to test the relationships between CFC-I, CFC-F, and different health behaviors.

Regarding health behavior as an intertemporal choice, we considered four scenarios that helped us formulate our hypotheses. The first scenario describes individuals who choose small benefits provided by unhealthy behaviors in present time, for instance, satisfying the urge to smoke or enjoying unhealthy food; whereas larger health costs occur in the far future in the form of diseases, such as heart problems, lung cancer, and, as a result, poor life quality, or even earlier death. The second perspective is that individuals avoid smaller health investments in the present, for instance, when they prefer not to go to a fitness class or postpone their visit to the dentist, thus sentencing themselves to larger health costs in the future. The third viewpoint is that minor costs, for instance, physical effort, time, and financial investment, are paid in the present to achieve better health in the future. To illustrate such behaviors we can mention going out for a walk and exercising, paying to visit a fitness center, or dancing classes. The fourth scenario is that minor benefits are foregone at the present time in order to obtain larger

health benefits in the future. Avoiding the pleasure of a portion of unhealthy food or alleviation of a smoking or a drinking urge, could be named as examples of sacrificed immediate benefits.

Individuals scoring high on CFC-I are concerned with the immediate consequences of their actions. Thus, we expected that individuals scoring high on CFC-I would prefer the short-term benefits provided by unhealthy behaviors, in our case, smoking and unhealthy eating (positive relationship), and avoid paying today's costs of health behaviors (i.e., healthy eating and physical activity; negative relationship).

High CFC-F individuals are concerned with the future consequences of their actions. Thus, we expected they would be more willing than low CFC-F people to engage in healthy behaviors in order to obtain good health in the future and avoid the temptation of short-term benefits provided by unhealthy behaviors.

Thus the first four hypotheses were:

H1: CFC-I is positively related to unhealthy behaviors.

H2: CFC-I is negatively related to healthy behaviors.

H3: CFC-F is negatively related to unhealthy behaviors.

H4: CFC-F is positively related to healthy behaviors.

Perceived connectedness/change in the future self

Another possible explanation for personal differences in temporal discounting—influencing intertemporal choice—and, thus, health behavior, could be found in the theory of multiple selves. Parfit (1971) describes a person in time as a model of multiple selves (i.e., a person in the present time and the same person in any time in the future are different selves). However, there is psychological continuity between the present and the future selves, as more close in time selves share more features with one another. The more features the selves share, the more connected they feel to one another. If one does not anticipate sharing many psychological features with a distant future self and is unsure of the qualities the distant self will have, one feels less connected to one's future self. Therefore, this self is regarded more like a stranger, and thus one feels less psychologically attached to it and cares less about its benefits. As a result, the outcome of the conflict between the present self's and the future self's interest (i.e., intertemporal choice) will be largely decided by the degree to which one feels psychologically connected to the future self and, thus, cares about that self. In other words, if one perceives oneself in the future as a stranger, one tends to care less about that unknown person.

A number of recent studies found an association between connectedness to the future self and discount rates. Ersner-Hershfield, Wimmer, et al. (2009) provided neurological evidence that people differ in connectedness to their future self. Participants who had more connectedness to their future selves demonstrated lower discounting rates. In later studies Ersner-Hershfield, Garton, et al. (2009) demonstrated that individuals with higher future self-continuity have a larger amount of savings, including pension savings (Ersner-Hershfield, 2011). Bartels and Urminsky (2011) found that people who are less connected to their future self tend to opt for short-term gains and to demonstrate higher discounting rates. Ersner-Hershfield et al. (2011) managed to prime perceived connectedness to the future self by allowing the subjects to interact with their aged-processed renderings in virtual reality; after manipulations, subjects were more likely to choose larger later rewards. Ersner-Hershfield et al. (2012) showed that lack of self-continuity leads to unethical behavior in business: low connected people prefer easy and quick rewards that they can attain with unethical behavior and they disregard the possible long-term consequences of such behavior.

Our research contributes to the existing theory by concentrating our attention on the relationship between perceived connectedness to the future self and health behavior, which was the second objective of our study. In line with previous research, we predicted that perceived connectedness would have a negative effect on temporal discounting rate. In our study, it meant that people with higher connectedness to the future self would demonstrate healthier behaviors in the present. The present study borrowed the measurement of perceived connectedness used in previous research (Bartels & Urminsky, 2011; Ersner-Hershfield, Garton, et al., 2009). However, for reasons explained in the Measures section, we used an inverted variant of the perceived connectedness to the future-self construct called "perceived change in the future self" (PCFS). Thus, we expected that PCFS would be positively related to unhealthy behaviors and negatively related to healthy behaviors. The hypotheses under investigation were:

H5: PCFS is positively related to unhealthy behaviors.

H6: PCFS is negatively related to healthy behaviors.

There may be interaction between personality factors (Carver & Scheier, 2008), thus focusing on main effects exclusively could possibly disguise synergistic or multiplicative relationships between traits (Baron & Kenny, 1986). Thus, the study tested whether PCFS moderated the relationships between CFC-I and CFC-F, and health behaviors. We assumed that, even if one was generally concerned with the immediate consequences of one's actions, one would try to resist one's immediate desires that are potentially health ruining if one feels connected to one's future self (i.e., score low

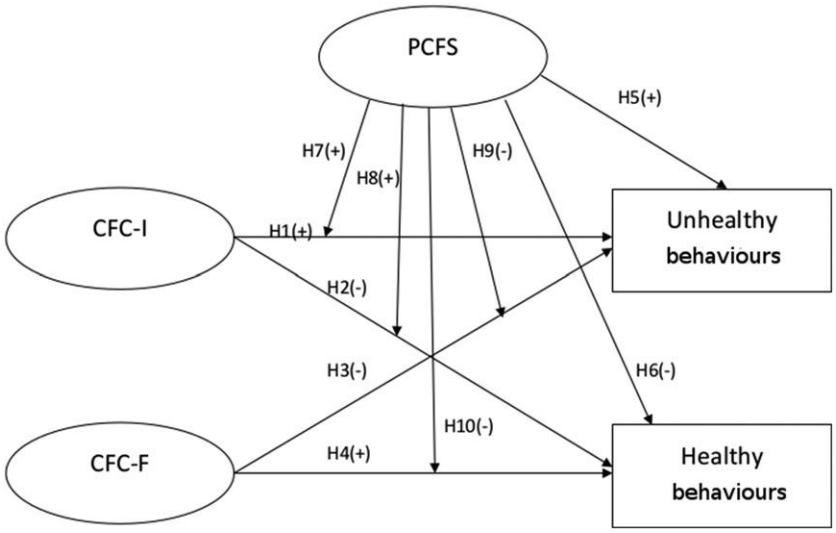

Figure 1. Conceptual model.

on PCFS). On the other hand, high perceived change should enhance the positive relationship between CFC-I and unhealthy behaviors, and the negative relationship between CFC-I and healthy behaviors. We also suggested that individuals who score high on CFC-F would not manifest it in their actual health behavior if they score high on PCFS because they would not associate their future self with their present self. Thus, PCFS was expected to strengthen the effects of CFC-I on health behaviors and weaken the effects of CFC-F. The hypotheses tested were:

H7: PCFS strengthens the positive relationship between CFC-I and unhealthy behaviors.

H8: PCFS strengthens the negative relationship between CFC-I and healthy behaviors.

H9: PCFS weakens the negative relationship between CFC-F and unhealthy behaviors.

H10: PCFS weakens the positive relationship between CFC-F and healthy behaviors

Figure 1 presents the conceptual model of the article and summarizes the hypotheses.

Method

Participants and procedure

A representative Norwegian population sample was recruited. A total number of 346 participants, 177 women and 169 men, aged between 18 and 65 ($M = 42$), answered an online questionnaire. A reputable survey company was hired for data collection. The questionnaire was translated from English into Norwegian.

Measures

Consideration of immediate and future consequences

In our work, we operate with the CFC-14 model (Joireman, Shaffer, Balliet, & Strathman, 2012). Consideration of future consequences was measured with the help of the CFC-14 questionnaire (Joireman et al., 2012). All items were rated on a 7-point Likert scale from −3 (*strongly disagree*) to +3 (*strongly agree*).

Perceived connectedness to the future self/perceived change in the future self

Initially, a perceived connectedness measure was borrowed from Ersner-Hershfield, Garton, et al. (2009) and Bartels and Urminsky (2011). However, the pretest showed that the wording confused the participants: some estimated their perceived degree of change rather than the degree of shared features. Thus, we made changes to our questionnaire by instructing respondents to estimate the degree to which their personality would change in the future, and we inverted the original scale. The participants were given the instruction: "Think about the important characteristics that make you the person you are now—your personality, temperament, major likes and dislikes, beliefs, values, ambitions, life goals, and ideals." Then they were asked to estimate how much their personality would change in 1 year/10 years/20 years and this was measured on an 11-point scale, ranging from 0% (*change/absolutely the same person*) to 100% (*change/completely different people*) with an interval of 10%.

In addition, we asked a general question about perceived change. The item was estimated with the help of a 7-point Likert scale from −3 (*completely disagree*) to +3 (*completely agree*), and was worded as follows: "To what degree do you agree/disagree with the following statement: My personality will change a lot in the future."

Health behavior consequences usually occur over many years, thus perceived change in one year would be irrelevant for predicting health choices. Next, a PCFS variable was computed as an average of three items: perceived change in 10 years, perceived change in 20 years, and a general measure of perceived change.

Healthy and unhealthy behaviors

This study examines two categories of health behavior: unhealthy (smoking and unhealthy eating) and healthy behavior (physical activity and healthy eating). Our decision was dictated by the probability that our independent variables could differentially predict these two types of health behavior

(Kalavana, Maes, & Gucht, 2010). Smoking and unhealthy eating represented unhealthy behavior in our study, whereas healthy behavior was expressed by healthy eating and physical activity. All health behavior measures were self-report behavior frequency measures with a one-month timeframe.

Smoking behavior (SB) was measured with one question: "How many cigarettes/pipes have you smoked on average per day during the last month?," and estimated on a 9-point scale where 1 = 0, 9 = 60 or more per day. The unhealthy eating habits variable (UFood) was a sum of three variables: eating cakes, unhealthy (sweet/salty) snacks, and drinking beverages with high sugar content. The items were measured on a 9-point scale ranging from 1 (*several times per day*) to 9 (*never*). The healthy eating variable (HFood) was computed by the sum of two variables: eating fruit and eating vegetables. The items were measured on a 9-point scale ranging from 1 (*several times per day*) to 9 (*never*). Physical activity (ACT) is a sum of two variables: walking and exercising status. The items were measured on a 6-point scale ranging from 1 (*every day*) to 6 (*never*). The scores on healthy eating, unhealthy eating, and physical activity were reversed for the analysis so that the higher score would represent higher behavior frequency.

Data analysis

First, two confirmatory factor analyses were performed in AMOS.22. We compared a two-factor CFC model versus a one-factor model in order to ensure internal consistency, and the convergent and discriminant validity of the CFC-I and the CFC-F constructs (Anderson & Gerbing, 1988). Next, we "imputed" composite CFC-I and CFC-F variables in AMOS. Before proceeding with the moderation analysis, we standardized interacting variables (Dawson, 2014). We performed a structural equation analysis of the model, estimating direct and interaction effects simultaneously and plotted them to ease interpretation (Dawson, 2014). The model was controlled for age, gender, and family status (living alone or with others and having or not having children).

Results

Confirmatory factor analysis

First, we conducted confirmatory factor analysis for a model with two CFC factors, which demonstrated a bad data fit (RMSEA = .127). Three items with low factor loadings were removed from further analyses: CFC-I3: "My convenience is a big factor in the decisions I make or the actions I take"; CFC-F4: "I think it is important to take warnings about negative outcomes

Table 1. Correlation matrix, standard error, and standard deviation.

	CFC-I	CFC-F	PCFS	SB	UFood	HFood	ACT
CFC-I							
CFC-F	−.54***						
PCFS	.14**	.14**					
SB	.17***	−.10	.04				
UFood	.29***	−.20***	.09*	.10			
HFood	−.23***	.29***	−.09*	−.08	−.05		
ACT	−.16***	.27***	−.10*	−.14**	.00	.31***	
M	3.68	4.52	4.71	1.99	11.86	13.12	8.65
SD	.90	.90	1.79	1.85	3.99	3.26	2.76

Note. SB = smoking behavior; CFC-I = consideration of immediate consequences; CFC-F = consideration of future consequences; PCFS = perceived change; HFood = healthy eating; UFood = unhealthy eating; and ACT = physical activity.
*$p < .1$; **$p < .05$; ***$p < .01$.

seriously even if the negative outcome will not occur for many years"; and CFC-I7: "Since my day-to-day work has specific outcomes, it is more important to me than behavior that has distant outcomes." These items have previously resulted in low factor loadings (Joireman et al., 2012; Toepoel, 2010). The new model indicated a satisfactory fit (Hu & Bentler, 1999): CMIN/df = 2.075, CFI = .948, RMSEA = .056. Composite reliability of constructs was higher than .7 (Hair, Anderson, Tatham, & Black, 1998): CFC-I = .85 and CFC-F = .81. Table 1 presents correlations between the study variables.

To test discriminant validity between CFC-I and CFC-F, we estimated a model with one CFC factor with exactly the same number of items and error term correlations as in the two-factor model (Bagozzi, Yi, & Phillips, 1991). The model fit was significantly worse: CMIN/df = 5.142, CFI = .786, RMSEA = .110. This result suggests that a two-factor CFC model represents the data better. Moreover, there was a moderate correlation between CFC-I and CFC-F, $r = -.54$. In summary, the measures of the proposed constructs achieve high reliability and satisfactory convergent and discriminant validity.

Structural equation analysis

Structural equation analysis executed in AMOS demonstrated good data fit (Hu & Bentler, 1999): CMIN/df = 1.383, CFI = .996, RMSEA = .033. Table 2 summarizes the results of the analysis. Predictive power (R^2) of the model was the following: $R^2_{SB} = .04$, $R^2_{UFood} = .11$, $R^2_{HFood} = .10$, $R^2_{ACT} = .08$.

Direct effects

There was a significant positive relationship between CFC-I and unhealthy behaviors (i.e., smoking, $p < .05$, and unhealthy eating, $p < .01$). The paths connecting CFC-I and healthy behaviors (i.e., healthy eating and physical

Table 2. The results of the SEM-analysis.

	Unhealthy behaviors		Healthy behaviors	
	SB	UFood	HFood	ACT
CFC-I →	.14**	.21***	−.07^{ns}	.01^{ns}
CFC-F →	−.02^{ns}	−.08^{ns}	.24***	.26***
PCFS →	.03^{ns}	.08^{ns}	−.11**	−.13**
CFC-I × PCFS →	.08^{ns}	.14*	−.01^{ns}	−.10^{ns}
CFC-F × PCFS →	.13*	.20***	.05^{ns}	−.12*

Note. PCFS = perceived change in the future self; CFC-I = consideration of immediate consequences; CFC-F = consideration of future consequences; SB = smoking behavior; HFood = healthy eating; UFood = unhealthy eating; ACT = physical activity; ns = nonsignificant.
*$p < .1$ (90% confidence level), **$p < .05$ (95% confidence level), ***$p < .01$ (99% confidence interval).

activity) were not significant. Thus, Hypothesis 1, stating that CFC-I would positively relate to unhealthy behaviors was confirmed; whereas Hypothesis 2, predicting that CFC-I would be negatively related to healthy behaviors, was not confirmed.

CFC-F had a significant positive relationship with healthy behaviors (i.e., healthy eating, $p < .001$, and physical activity, $p < .001$). The relationship between CFC-F and unhealthy behaviors was negative, but nonsignificant. Thus, Hypothesis 4 that predicted CFC-F would be positively related to healthy behaviors was confirmed; whereas Hypothesis 3 that stated CFC-F would have a negative relationship to unhealthy behaviors, was not confirmed.

The paths between PCFS and unhealthy behaviors (i.e., smoking and unhealthy eating) were positive but not significant. The relationship between PCFS and healthy behaviors (i.e., healthy eating and physical activity) were negative and significant ($p < .05$). Thus, Hypothesis 5 was not confirmed, whereas Hypothesis 6 was confirmed.

PCFS as a moderator

We hypothesized that PCFS would strengthen the positive relationship between CFC-I and unhealthy behaviors (H7) and that it would strengthen the negative relationship between CFC-I and healthy behaviors (H8). PCFS strengthened the positive relationship between CFC-I and unhealthy eating. The moderation effect of PCFS on the link between CFC-I and smoking was pointing in the predicted direction, but was nonsignificant. The moderation effect of PCFS on the relationship between CFC-I and unhealthy eating was significant at the 90% confidence interval ($p = .052$). The moderation effect of PCFS on the link between CFC-I and healthy behaviors was not significant. Thus, Hypothesis 7 was only partially confirmed, whereas Hypothesis 8 was not confirmed. Figures 2 and 3 present

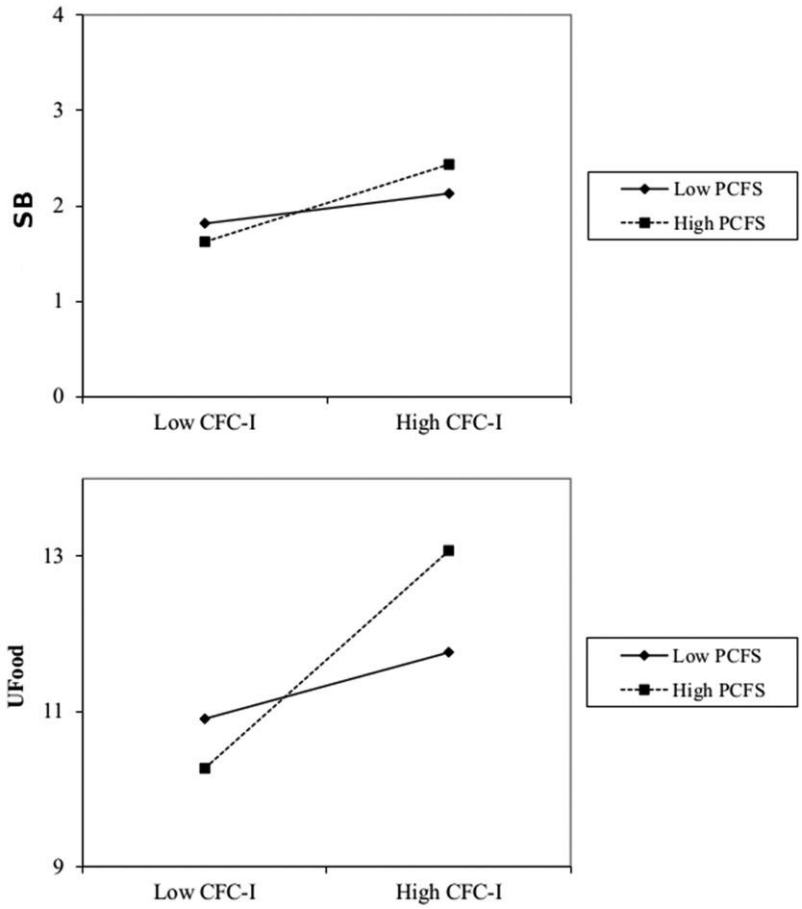

Figure 2. Moderating effect of PCFS on the relationship between CFC-I and unhealthy behaviors.

the moderation effect of PCFS on the link between CFC-I and unhealthy and healthy behaviors, respectively.

We expected that high PCFS levels would weaken the negative effect of CFC-F on unhealthy behaviors (H9), and the positive effect of CFC-F (H10) on healthy behaviors. Hypothesis 9 was confirmed: High levels of PCFS weakened the negative influence of CFC-F on unhealthy eating ($p < .001$). The moderating effect of PCFS on the link between CFC-F and smoking was smaller, but significant at the 90% confidence interval ($p = .069$). Hypothesis 10 was not confirmed: The moderating effect of PCFS on the link between CFC-F and healthy eating was not significant, and the effect on the link between CFC-F and ACT was negative, as predicted, but barely significant at the 90% confidence interval ($p = .099$). Figures 4 and 5 present the moderation effect of PCFS on the link between CFC-F and unhealthy and healthy behaviors, respectively.

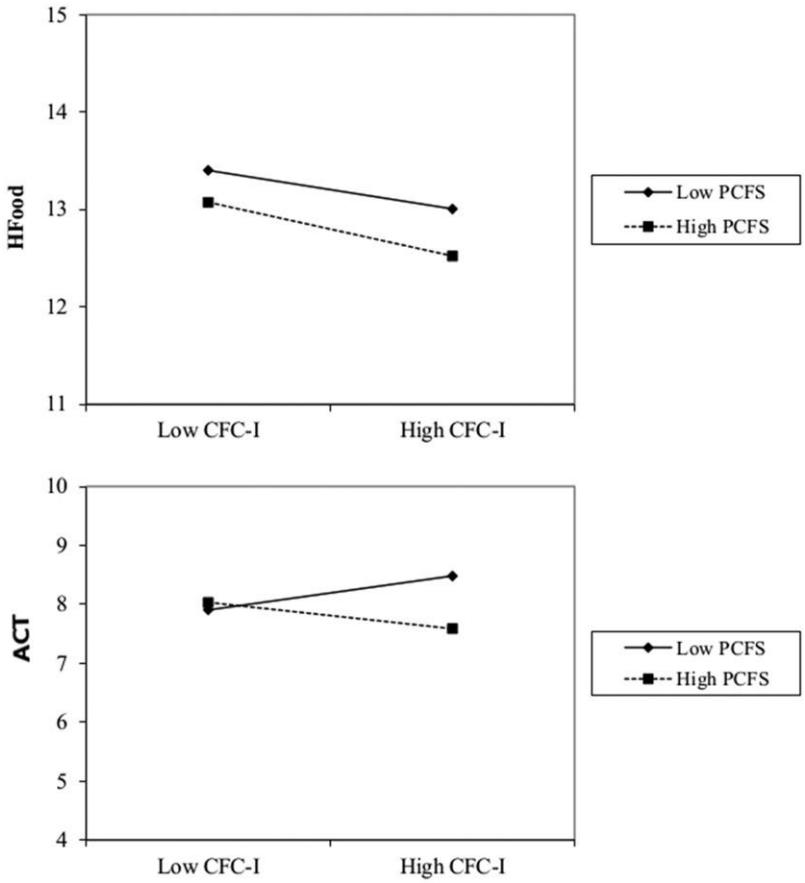

Figure 3. Moderating effect of PCFS on the relationship between CFC-I and healthy behaviors.

Discussion

The present study contributed to theory development in several ways. First, we tested the relationship between the two factors of CFC and health behaviors with different valence (i.e., healthy and unhealthy behaviors). The results suggest that consideration of immediate and future consequences might differentially predict healthy and unhealthy behaviors. As hypothesized, we found that those who were more concerned with the immediate consequences of their actions tended to engage in unhealthy behaviors such as smoking and eating unhealthy food more frequently than those who score lower on CFC-I. Unexpectedly, being concerned with the future outcomes of one's actions did not seem to influence unhealthy behaviors. However, the participants who scored higher on CFC-F were more likely to engage in healthy behaviors such as eating healthy food and exercising, whereas CFC-I did not have an influence on healthy behaviors. These findings suggest that CFC-I might be a stronger predictor of unhealthy behaviors, whereas CFC-F might be a stronger predictor of

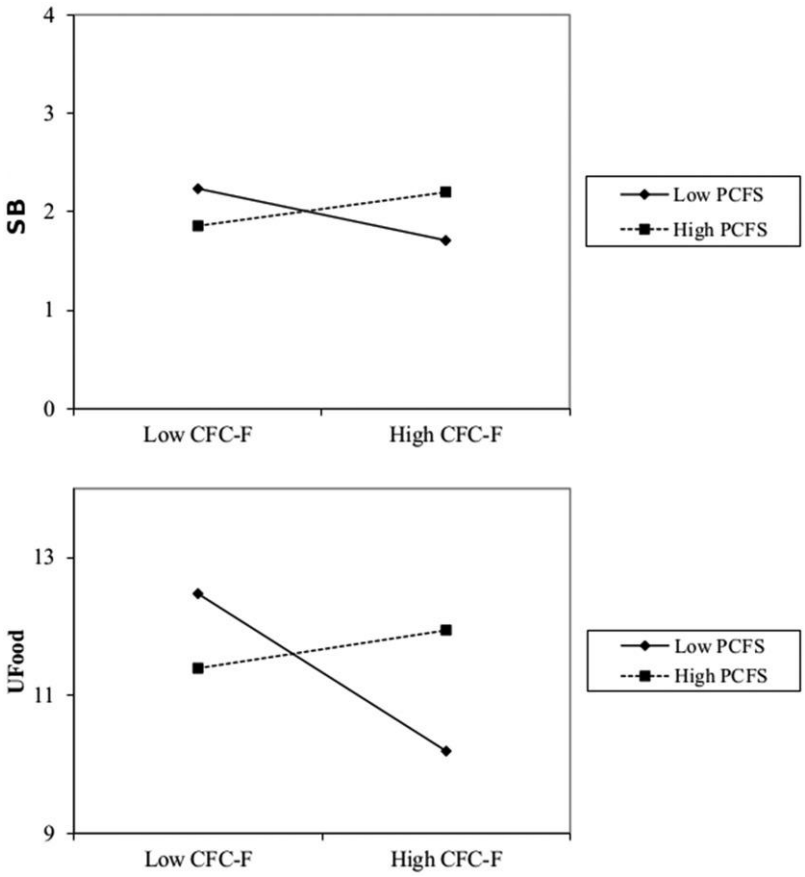

Figure 4. Moderating effect of PCFS on the relationship between CFC-F and unhealthy behaviors.

healthy behaviors. Moreover, these results give support to the earlier findings that consideration of future consequences is a two-factor construct, consisting of CFC-I and CFC-F (Joireman et al., 2008), and gives further ground to the practice of subdividing health behaviors into two categories: healthy and unhealthy behaviors (Kalavana et al., 2010).

From a regulatory focus perspective, our results might suggest that high CFC-I people tended to prefer the immediate benefits provided by unhealthy behaviors but did not try to avoid the costs of healthy behaviors in the present. Whereas high CFC-F individuals tended to engage in healthy behaviors but did not try to avoid smoking or eating unhealthy foods more than low CFC-F people. In light of these findings, it would be interesting to consider the relationship between CFC and regulatory focus (Higgins, 1987; Higgins, Roney, Crowe, & Hymes, 1994). Joireman et al. (2012) studied the relationship between CFCs, regulatory focus, and health intention/behavior. The authors studied self-reported healthy behaviors (i.e., healthy eating and exercising). The results of our research suggest that

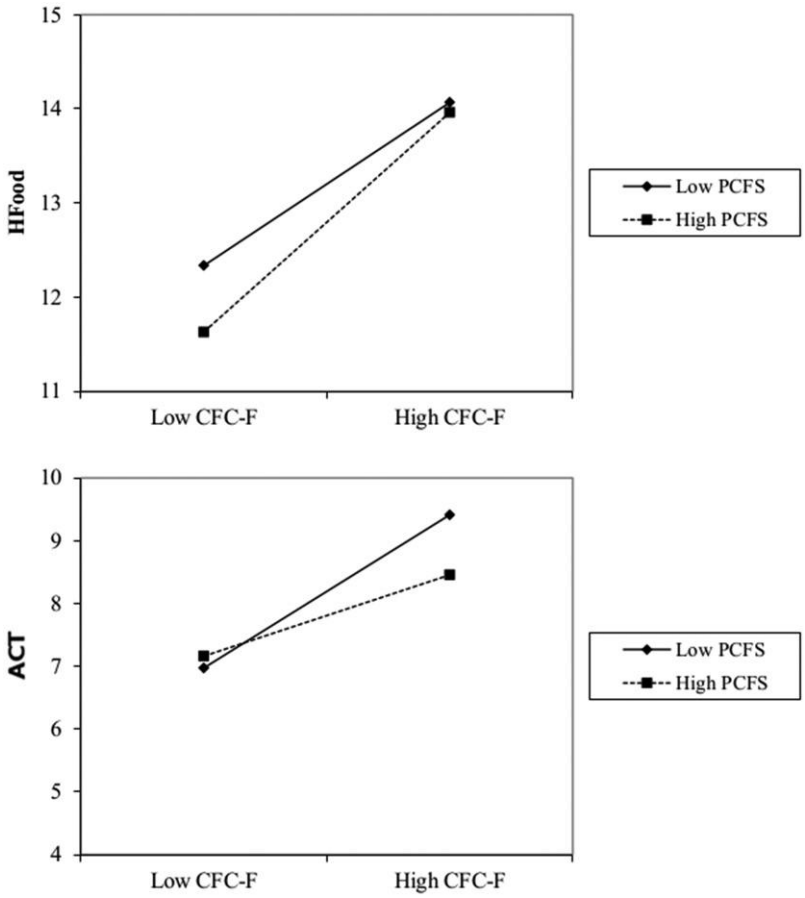

Figure 5. Moderating effect of PCFS on the relationship between CFC-F and healthy behaviors.

people concerned with immediate consequences would prefer the immediate benefits of unhealthy behaviors, thus adopting promotion behavior; however, they did not avoid the costs of future-oriented behavior, thus they did not adopt a prevention focus. People concerned with their future would prefer healthy behaviors that gave positive outcomes in the future, thus adopting promotion behavior, whereas they did not adopt a prevention focus by avoiding unhealthy behavior. Thus, we can see that future study of the relationship between CFC and regulatory focus in the context of both healthy and unhealthy behavior is needed.

Second, we were the first to explore the relationship between perceived change in the future self and healthy behavior and its moderating effect on the relationship between CFCs and health behaviors. The results have shown that PCFS relates healthy and unhealthy behaviors in different ways. PCFS had a direct negative association with healthy behaviors. It could mean that people who believed their personality would greatly change in the future (i.e., those who did not feel psychological connectedness to their

future self) were less likely to engage in healthy behaviors. Furthermore, PCFS strengthened the positive relationship of CFC-I and dampened the negative relationship CFC-F with unhealthy behaviors. Though the moderation effect of PCFS on the link between CFC-I and smoking was not significant, we attribute it to one of the limitations of our study.

Previous research has shown that health messages tailored to specific personality traits associated with the desired behavior tend to be more effective than nontailored messages (Cheng, 2015; Park, 2012; York, Brannon, & Miller, 2012). Our findings may have practical implications in developing behavioral change therapy and health communication. First, we found that future-oriented people tended to be more engaged in healthy behaviors, but they did not engage less in unhealthy behaviors. Present-oriented people were more engaged in unhealthy behaviors, but were not less engaged in healthy behaviors. These findings might suggest that when promoting healthy behaviors, it could be more beneficial to emphasize their long-term benefits. Moreover, the campaigns against unhealthy behaviors might be more effective if they reduced the immediate attractions of the behavior, whereas emphasizing the negative future consequences of an unhealthy behavior might be less effective. Existing health communication research partially confirms our findings. For instance, de Bruijn and Budding (2016) observed that gain-framed messages were more persuasive than loss-framed messages when combined with long-term consequences. However, further research is needed to investigate the relationship between CFCs, message framing, and health behavior.

Second, a significant direct negative relation between PCFS and healthy behaviors and a significant moderating effect on the link between time CFCs and unhealthy behaviors might suggest that health communication programs are needed that would contribute to decreasing individuals' perceived future change. To our knowledge, there has been no research studying the effect of PCFS on health communication impact. Future research might consider evaluating the moderating effect of PCFS on the relationship between temporal message framing and health intentions or health behavior.

A general limitation to our work was a skewed distribution of data on the SB scale with little variation: out of 346 respondents, 254 were nonsmokers. This could account for nonsignificant and weak interactions, and rather low explanatory power, $R^2_{SB} = .04$. Moreover, the low explanatory power of the model and effect sizes could be attributed to the fact that we studied the relationship between general personality factors and specific behaviors. Van Beek, Antonides, and Handgraaf (2013) have shown that behavior-specific personality measures have better predictive power. Thus, in future research, behavior-specific measures of CFC-I and CFC-F could be considered.

Furthermore, the nonexperimental study design did not allow us to make conclusions about causality. Thus, we encourage future research on the influence of perceived connectedness to the future self/perceived change in the future self on health behavior with the use of experimental design.

In the present study, we used self-report measures of health behavior that could be susceptible to social desirability and social approval biases (Paul, Rhodes, Kramer, Baer, & Rumpler, 2005; Prince et al., 2008). Thus, using such measures is unsuitable for some research purposes, such as assessing the exact nutrition intake (Cade, Thompson, Burley, & Warm, 2002). Nevertheless, behavior frequency questionnaires remain commonly used for accessing habitual behaviors. Self-report behavior frequency questionnaires were used by McKay et al. (2013), Henson, Carey, Carey, and Maisto (2006), Hall and Fong (2003), and Strathman et al. (1994) when establishing links between time perspectives and health behavior.

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Health and Disability

General vs health-specific consideration of immediate and future consequences to explain eating and exercise behavior in a Norwegian student population: A randomized survey experiment

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Pozolotina, T. & Olsen, S. O. (2020). General vs health-specific consideration of immediate and future consequences to explain eating and exercise behavior in a Norwegian student population: A randomized survey experiment. *Scandinavian Journal of Psychology*.

Over several decades, the consideration of future consequences (CFC) construct has been used to explain and predict health behaviors. However, the reported associations between CFC and health behaviors are relatively weak, leading to the low explanatory power of the models. Recent research suggests that CFC can be a domain-specific construct. In this study, we explored the psychometric properties of the Norwegian CFC-general and CFC-health questionnaires in terms of factor structure and discriminant and convergent validity and tested the association between the general and domain-specific CFC and exercise and eating behaviors. In a randomized survey experiment, 1,001 university students were assigned to either a CFC-general or a CFC-health questionnaire. In the tested models, two dimensions of CFC, consideration of immediate consequences (CFC-I) and consideration of future consequences (CFC-F), were independent variables. The exercise and eating behaviors, measured both as self-evaluated behaviors and self-reported frequency measures, were dependent variables. The results showed that in both CFC-general and CFC-health, CFC-I and CFC-F are distinct dimensions that differentially explain variance in health behaviors. A domain-specific CFC-health explained a significantly higher amount of variance in self-reported eating and exercising behaviors than a general CFC. Self-evaluated health behaviors were better explained by CFC than self-reported behavioral frequencies. Practical implications of the findings and avenues for future research are discussed.

Key words: CFC-health, CFC in Norwegian, Consideration of future consequences, domain-specific CFC, domain-specific time perspective.

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INTRODUCTION

The obesity epidemic is a growing concern worldwide (Global Burden of Disease [GBD] 2015 Obesity Collaborators, 2017; Han, Correa, Lean *et al*., 2017), including in Norway (Jacobsen & Aars, 2016). Poor diet, that is, a low-fiber diet high in fat, sugar, and processed foods, along with insufficient physical activity, are the main causes of weight gain (Camacho & Ruppel, 2017; Monteiro, Moubarac, Cannon, Ng & Popkin, 2013; Riera-Crichton & Tefft, 2014). Thus, understanding the underlying drivers of eating and exercise behaviors is essential when developing health behavior intervention programs and social marketing campaigns.

The health effects of individuals' dietary choices and physical activity are not attainable immediately, so prioritizing future goals, planning, and self-discipline are needed to avoid present temptations and attain future results (Sirois, 2004). Thus, the construct of consideration of future consequences (CFC), defined as "the extent to which individuals consider the potential distant outcomes of their current behaviours and the extent to which they are influenced by these potential outcomes" (Strathman, Gleicher, Boninger & Edwards, 1994, p. 743) is suitable for explaining individual health behavior. The association between CFC and health intentions, and CFC and various health behaviors, including eating and exercising, was established in numerous studies (Adams, 2012; Adams & Nettle, 2009; Daugherty & Brase, 2010; McKay, Percy & Cole, 2013; Peters, Joireman & Ridgway, 2005).

CFC was initially introduced as a unidimensional construct with 12 items. However, later research has not been unanimous on whether CFC has one or two dimensions (Hevey *et al*., 2010; Joireman, Balliet, Sprott, Spangenberg & Schultz, 2008; McKay, Morgan, van Exel & Worrell, 2015; Rappange, Brouwer, Job & Van Exel, 2009). Joireman, Shaffer, Balliet, and Strathman (2012) tested a CFC scale with two extra items and two dimensions: consideration of immediate consequences (CFC-I) and consideration of future consequences (CFC-F). The constructs of CFC-I and CFC-F reflect individual differences in prioritizing, respectively, immediate or distant outcomes of one's actions when making decisions. Thus, it is reasonable to expect that high CFC-I individuals who value immediate outcomes of their actions would be more predisposed to unhealthy behaviors with their short-term benefits, such as taste, comfort, and immediate satisfaction of desires. On the contrary, high CFC-F individuals are expected to value more distant future health outcomes of healthy behaviors.

Earlier studies do not report unanimous results on which CFC factor, CFC-I, CFC-F or both, relates to personality features and behaviors. For instance, Rappange *et al*. (2009) confirmed a correlation between CFC-I and CFC-F and temporal discounting. CFC-I, but not CFC-F, was positively associated with smoking and body mass index in Adams (2012), and negatively related to environmental concern and behavior motivation in Arnocky, Milfont and Nicol (2014). Meanwhile, McKay *et al*. (2013) showed CFC-F was negatively associated with drinking. A further issue is that the explained variance of the models varies

dramatically between studies, and is often rather low (Murphy & Dockray, 2018).

A potential explanation for these controversial findings and the low correlation between CFC and health behaviors in the earlier studies is the fact that CFC was measured at a general level while the behaviors it was expected to explain were on a very specific level. The principle of compatibility or symmetry (Ajzen, 2005; Ajzen & Fishbein, 1977) states that the more correspondence there is between the degree of generality of criterion and the predictor, the more they are expected to correlate. In other words, specific behaviors are better predicted or explained by the constructs specific to those behaviors. Differences between general and domain-specific scales have been studied for the construct of self-esteem (Gentile, Grabe, Dolan-Pascoe *et al*., 2009), self-efficacy (McAvay, Seeman & Rodin, 1996) and risk attitude (Zhang, Zhang & Shang, 2016). Recent research provides evidence that CFC could be regarded as a domain-specific and a behavior-specific construct since an individual can be immediate- or future-oriented in some spheres of life, but not in others. Murphy, Cadogan and Dockray (2020) showed that participants varied in their CFC-I and CFC-F scores across five domains: work, health, environment, money, and college. McKay, Perry and Cole (2018) found that the domain-specific CFC-health did not correlate with CFC-Finance in a university student sample, while CFC-environment did not correlate with CFC-academic in an adolescent sample. On a behavior-specific level, Dassen, Houben and Jansen (2015) reported that general CFC did not predict eating behavior, whereas both CFC-Food/immediate and CFC-Food/future were related to eating. Furthermore, van Beek, Antonides and Handgraaf (2013) noted that only CFC-Food/immediate predicted eating behavior, and CFC-exercise/future predicted exercise behavior. Murphy and Murphy (2018) showed that a behavior-specific CFC-driving was more strongly associated with driving behavior than a general CFC.

Joireman and King (2016) included domain-specific CFC as one of the eight avenues for future research on the topic of CFC. In a meta-analysis, Andre, van Vianen, Peetsma and Oort (2018) presented evidence that the domain-specific time perspective predicted behavior better than the general construct in the field of education, but acknowledged that research of the domain-specific CFC in the field of health is insufficient. In a recent study by Murphy *et al*. (2020), CFC-health had a stronger correlation with health behaviors than a general CFC.

Our study contributes to the extant research of the domain-specific CFC-health by testing experimentally whether CFC-health would explain health behaviors better than CFC general. Unlike the previous studies (Dassen *et al*., 2015; Murphy *et al*., 2020; van Beek *et al*., 2013) that used a within-subject design, the present study uses a survey experiment, with random group assignment. Random assignment allows for strong causal inferences through controlling for biases and covariate effects (Kohavi, Longbotham, Sommerfield & Henne, 2009; Wilkinson & Task Force on Statistical Inference, 1999).

In light of earlier research and in accordance with the principle of compatibility (Ajzen, 2005), a behavior-specific CFC, like CFC-Food or CFC-exercise, should be a better predictor of that particular behavior than a general CFC, but it is supposedly worse at predicting other behaviors. A behavior-specific CFC could be good for understanding and targeting that specific behavior. However, a more general domain-specific CFC, like CFC-health, could be used to predict or explain several behaviors within a domain when temporal and financial resources are limited. Researchers are faced with limited assessment time, and shorter variants of questionnaires are required. Therefore, if CFC-health explains or predicts various health behaviors within the health domain, from the financial and temporal perspective, it might be more reasonable to use it instead of a more behavior-specific scale. Some previous research (van Beek *et al*., 2013; Dassen *et al*., 2015) examined the relationships between behavior-specific CFC and health behaviors in a model with behavior-specific CFC-I and CFC-F as independent variables and those specific behaviors as dependent variables. The present study aimed to explore the psychometric properties of CFC-general and CFC-health in terms of factor structure and discriminant and convergent validity. Another goal was to test whether an adapted CFC-health would have a stronger association with exercise and eating behaviors than a general CFC, and to see whether the strength of the relationships and the explanatory power of the model would be comparable to those of the more behavior-specific CFC-Food and CFC-exercise in van Beek *et al*.'s (2013) study.

METHOD

Participants and procedure

All students from a larger university in Norway (approx. 15,000 students) received an e-mail invitation to participate in an online survey in exchange for a chance to win an iPad. A simple Java-script code was written to randomly redirect participants to either a general or a health-specific variant of the questionnaire. The respondents (N = 1,001) were randomly assigned to answer either a general (N = 498) or a health-specific (N = 503) variant of the questionnaire. The questionnaires were conducted in Norwegian.

Earlier research (Johnson, 2005) has shown that unsupervised internet surveys can be subject to careless responding defined as "responding without regard to item content" (Nichols *et al*, as cited in Meade & Craig, 2012, p. 437). After removing careless responses, using a combination of three approaches: long string index, psychometric synonyms and antonyms, and Mahalanobis distance (Meade & Craig, 2012), the number of respondents totaled 445 and 465, respectively. In total, we removed 10.6% of responses from the general questionnaire and 7.6% of responses from the health-specific questionnaire. These rates were close to the careless response estimation provided in Meade and Craig (2012). The mean age of the participants was 28 and 27 years in the general and health-specific surveys, respectively, with 60% female participants in both.

Measures

The general CFC was measured using a two-dimensional variant of the consideration of future consequences scale (CFCS; Joireman *et al*., 2012), for example, *My behavior is only influenced by the immediate (i.e., a matter of days or weeks) outcomes of my actions* (CFC-I) and *I consider how things might be in the future, and try to influence those things with my day to day behavior* (CFC-F). This questionnaire was also adapted to measure a health-specific variant of the CFCS, for example, *My health behavior is only influenced by the immediate (i.e., a matter of days or weeks) outcomes of my actions* (CFC-I) and *I consider how my health might be in the future, and try to influence my future health with my day to day behavior* (CFC-F). In the process of adaptation, we tried to stay as close as possible to the original wording of the CFC-14 questionnaire, and

only replaced general words with health-specific words, such as *things* replaced with *health* and *behavior* replaced with *health behavior*. The 14 items of the CFCS were assessed by a seven-point Likert-type scale, ranging from 1 = strongly disagree to 7 = strongly agree. The adapted CFC-health scale is presented in online Appendices 1 and 2 are in both the English and Norwegian languages, respectively.

For the purpose of comparison with the study by van Beek *et al.* (2013), we measured eating and exercising behavior using similar response formats (Christian, Dillman & Smyth, 2008; Schwarz, 1999). The first format we called "self-evaluated eating/exercising behaviors" (SEEB, SEExB), the second "frequency of eating/exercise behavior" (FEB, FExB). SEEB and SEExB were measured by the items *How would you rate your general eating/physical activity and exercise habits?* on a seven-point scale, ranging from 1 = very unhealthy to 7 = very healthy. To assess FEB and FExB, we asked participants to report how often they ate vegetables, fruit, fish, fast food, fatty food and sweets, and drank sugary drinks. The items were measured on a nine-point scale: *never*; *once in a while*; *once in 14 days or more seldom*; *once a week … daily*; *several times per day*. Then, the unhealthy eating items were reverse-coded, and the average of all the items was calculated. Exercise behavior was estimated by self-reported exercise frequency, assessed on a seven-point scale: *never*; *once per month or less*; *once per week … every day*.

RESULTS

Validity and reliability

First, we performed invariance tests for the dependent variables SEEB, SEExB, FEB, and FExB, as well as the independent variable age in the samples. The *t*-tests revealed no difference in the study variables. Table 1 presents the results of the tests.

Next, we executed confirmatory factor analyses (CFA) of general and health-specific CFC constructs in IBM SPSS Statistic 24. All items loaded their respective factors. However, CFC-I3: *My convenience is a big factor in the decisions I make or the actions I take* demonstrated extremely low loading (< 0.3). Toepoel (2010) has also reported that a CFC-I3 item had a very low item-total correlation. CFC-F4: *I think it is important to take warnings about negative outcomes seriously even if the negative outcome does not occur for many years* also demonstrated low loading (< 0.4). This item had a rather low loading (0.5) in Joireman *et al.* (2012). Both items were removed from further analyses. We allowed for a correlation between error terms of CFC-I1 and CFC-I2, and CFC-F6 and CFC-F7 in both models. Correlating error terms of similarly worded items and items appearing near to each other on the questionnaire is acceptable (Bollen & Lennox, 1991).

As the current research does not have a uniform position concerning the number of factors of CFCS (Hevey *et al.*, 2010; Joireman *et al.*, 2008; McKay *et al.*, 2015; Rappange *et al.*, 2009), we tested two alternative models with items loading on one and two CFC factors in IBM SPSS AMOS 24. The two-factor model demonstrated good data fit: CMIN/df = 2.862, GFI=0.950, CFI = 0.954, RMSEA = 0.065 and CMIN/df = 1.979, GFI = 0.965, CFI = 0.978, RMSEA = 0.046 for the general and health-specific scale, respectively. The cut-off criteria for good fit are: CMIN/df < 3, GFI ≥ 0.95, CFI ≥ 0.90, RMSEA < 0.08 (Coughlan, Hooper & Mullen, 2008; Hu & Bentler, 1999). The one-factor model had significantly worse data fit: CMIN/df = 9.369, GFI = 0.795, CFI = 0.788, RMSEA = 0.137 and CMIN/df = 8.073, GFI = 0.818, CFI = 0.840, RMSEA = 0.123, $\Delta\chi^2 = 341.24$, $\Delta df = 1$ ($p = 0.000$) $\Delta\chi^2 = 318.88$, $\Delta df = 1$ ($p = 0.000$) for the general and health-specific scales, respectively. Thus, the discriminant validity between CFC-I and CFC-F for both the general and health-specific model is confirmed (Bagozzi, Yi & Phillips, 1991). The fit indices of one- and two-factor models for CFC-general and CFC-health are summarized in Table 2, while Table 3 presents the correlations and composite reliability scores.

The composite reliability of the constructs was higher than 0.7 (Hair, Anderson, Tatham & Black, 1998): CFC-I = 0.84 and CFC-F = 0.82 in the general questionnaire, and CFC-I = 0.85 and CFC-F = 0.81 in the health-specific questionnaire.

Associations with eating and exercising behaviors

Using AMOS, we performed SEM analyses of path models to estimate the influence of CFC-I and CFC-F on eating and exercising behaviors. All models demonstrated a good data fit, RMSEA < 0.07 (Hu & Bentler, 1999). To assess whether the results for a general and a health-specific model were significantly different, we performed several chi-square difference tests comparing paths. We compared the models where all regression paths between independent and dependent variables were constrained to an unconstrained model. This approach helped us to establish the difference between the explanatory power of the

Table 1. *Comparison of two samples, invariance test of dependent variables and age, the results of two-tailed t-tests*

	Mean (SD) General model N = 445	Mean (SD) Health-specific model N = 465	*t*-value (*p*)
Age (years)	27.6 (7.9)	27.2 (7.1)	0.85 (0.40)
Self-evaluated eating behavior	4.7 (1.2)	4.6 (1.0)	1.25 (0.21)
Self-evaluated exercising behavior	4.5 (1.7)	4.3 (1.7)	1.83 (0.07)
Frequency of eating behavior	6.2 (0.9)	6.1 (0.9)	0.80 (0.42)
Frequency of exercising behavior	3.9 (1.5)	3.7 (1.5)	1.60 (0.11)

Note: N = number of respondents, SD = standard deviation, *p* = probability.

Table 2. *Fit indices for confirmatory factor analysis of CFC-general and CFC-health, one- versus two-factor solutions*

	χ^2/df	GFI	CFI	RMSEA	$\Delta\chi^2/\Delta df$ (*p*)
General model, one-factor	9.369	0.795	0.788	0.137	341.24/1 ($p = 0.000$)
General model, two-factor	2.862	0.950	0.954	0.065	
Health-specific model, one-factor	8.073	0.818	0.840	0.123	318.88/1 ($p = 0.000$)
Health-specific model, two-factor	1.979	0.965	0.978	0.046	

Note: χ^2/df = chi-square/degrees of freedom; GFI = goodness-of-fit index; CFI = comparative fit index; RMSEA = root mean square error of approximation.

Table 3. *Correlation matrix*

	1	2	3	4	5	6	7
1. CFC-I	1.00	−0.53***	−0.18***	−0.09	−0.27***	−0.06	−0.20***
2. CFC-F	−0.58***	1.00	0.26***	0.22***	0.24***	0.18***	0.08
3. SEEB	−0.39***	0.47***	1.00	0.48***	0.57***	0.39***	0.12**
4. SEExB	−0.39***	0.54***	0.53***	1.00	0.32***	0.76***	−0.07
5. FEB	−0.39***	0.37***	0.61***	0.42***	1.00	0.30***	0.24***
6. FExB	−0.30***	0.46***	0.31***	0.73***	0.35***	1.00	−.14***
7. Age	−0.11**	0.02	0.16***	0.10**	0.16***	−0.02	1.00

Notes: the correlation coefficients are presented on the top of the table for CFC-general, and on the bottom of the table for CFC-health. CFC-I = consideration of immediate consequences, CFC-F = consideration of future consequences, SEEB = self-evaluated eating behavior, SEExB = self-evaluated exercise behavior, FEB = frequency of eating behavior, FExB = frequency of exercise behavior.
**$p < 0.5$, ***$p < 0.01$.

Table 4. *Model summary, path coefficients, RMSEA and the results of the chi-square difference test for general and health-specific models*

Path/predictive power of the model (R^2)	CFC-general	CFC-health	$\Delta\chi^2/\Delta df$ (p)
Self-evaluated eating behavior (SEEB)			
CFC-I → SEEB	−0.06	−0.18***	0.821/1
CFC-F → SEEB	0.23***	0.37***	2.001/1
R^2	0.07	0.24	6.917/2**
RMSEA	0.061	0.046	
Self-evaluated exercise behavior (SEExB)			
CFC-I → SEExB	0.04	−0.12**	2.508/1
CFC-F → SEExB	0.24***	0.48***	6.158/1**
R^2	0.05	0.31	20.959/2***
RMSEA	0.059	0.042	
Frequency of eating behavior (FEB)			
CFC-I → FEB	−0.19***	−0.26***	0.065/1
CFC-F → FEB	0.14**	0.22***	0.500/1
R^2	0.09	0.18	0.546/2
RMSEA	0.059	0.042	
Frequency of exercise behavior (FExB)			
CFC-I → FExB	0.05	−0.04	1.153/1
CFC-F → FExB	0.21***	0.44***	4.383/1**
R^2	0.04	0.22	13.104/2***
RMSEA	0.058	0.046	

Notes: CFC-I = consideration of immediate consequences, CFC-F = consideration of future consequences, RMSEA = root mean square error of approximation.
**$p < 0.05$, ***$p < 0.01$.

models. Then, we compared the models on a path-by-path level. Table 4 summarizes the results of the tests.

The explanatory power of the models with health-specific CFCS was higher than of the model with general CFCS: $R^2 = 0.31$ versus $R^2 = 0.05$ for SEExB, $R^2 = 0.24$ versus $R^2 = 0.07$ for SEEB, $R^2 = 0.22$ versus $R^2 = 0.04$ for FExB, $R^2 = 0.18$ versus $R^2 = 0.09$ for FEB. All were significantly different, except for FEB. On the path-by-path level, CFC-F has a stronger association with SEExB and FExB, as well as SEEB than CFC-I. CFC-I had a slightly stronger association with FEB than CFC-F. There were no statistically significant gender differences in the causal effects.

The explanatory power of the models with CFC-health is comparable to the models with behavior-specific CFC in van Beek *et al*. (2013), who reported $R^2 = 0.39$ and 0.26 for SEExB and SEEB, respectively.

DISCUSSION

This study was the first to explore the psychometric properties of CFC-general and a domain-specific CFC-health in terms of factor structure, discriminant, and convergent validity in the Norwegian student population. Our study presented further evidence that both CFC-general and CFC-health incorporate two related, but distinct, dimensions – CFC-I and CFC-F – that differentially explain variance in health behaviors. In general, CFC-I was negatively related to healthy behaviors, whereas CFC-F was positively associated with healthy behaviors. Nonetheless, the study revealed that CFC-F was a stronger predictor of exercise behavior than CFC-I. This result supports the findings of van Beek *et al*. (2013), in which CFC-F, but not CFC-I, was a significant predictor of exercise behavior. The study further supports the findings by Pozolotina and Olsen (2019) that CFC-F is a better predictor of healthy behaviors than CFC-I. However, unlike the study of van Beek *et al*. (2013), the present work demonstrated that CFC-F was also a stronger predictor of SEEB than CFC-I in both CFC-general and CFC-health. CFC-I was a significant predictor of SEEB in CFC-health, but not in CFC-general. FEB was significantly predicted by both CFC-I and CFC-F in CFC-general and CFC-health. This finding could potentially result from the fact that FEB was a combination of healthy and unhealthy eating, and there could be different mechanisms underlying the connection between CFC-I and CFC-F and healthy and unhealthy eating.

The present study was the first to use a randomized experimental design to present evidence that the domain-specific CFC-health explains specific health behaviors, in particular, eating and exercise behaviors, better than the general CFC. The differences between the explanatory powers of the models with CFC-general and CFC-health were statistically significant, except for the models for FEB, although the explanatory power of the domain-specific model was twice as high as the general model. In general, self-evaluated health behaviors were better explained by the health-specific CFC than self-reported behavioral frequencies. The higher correlation between self-evaluated behaviors and CFC might be explained by the fact that the respondents were asked to evaluate how healthy/unhealthy their behaviors were. Individuals

can differ greatly in their beliefs about what is healthy and unhealthy (Carels, Konrad & Harper, 2007), and a self-evaluative measure would account for such differences. In contrast, the relationship between a frequency measure of specific behavior and CFC could be influenced by individual beliefs. This scenario particularly applies to FEB, because while most people agree that exercise and physical activity are good for health, individuals can vary in their beliefs about what food is healthy/unhealthy. For instance, some believe that vegan food is best for their health, while others believe in a low-carbohydrate diet and try to avoid fruit and vegetables in favor of meat and fats. Another explanation to this finding could lie in individual compensatory beliefs which deem that it is possible to perform some unhealthy behaviors and still be healthy, as long as such behaviors are compensated for by healthy behaviors. For example, unhealthy eating or smoking compensated for by extra physical activity (Berli, Loretini, Radtke, Hornung & Scholz, 2014). Thus, individuals might care about their future health, and score high on CFC-F (health) which would correlate with their self-evaluated health behavior but score low on a behavioral frequency measure due to their specific health beliefs.

The results of the present study have several practical implications and suggest several avenues for future research. First, we have experimentally shown that the domain-specific CFC-health was a better predictor of health behaviors than a general CFC. Furthermore, the explanatory power of the models with CFC-health is comparable to the models with behavior-specific CFC in van Beek *et al*. (2013). In cases where one particular health behavior is in focus, it might be more advantageous to use behavior-specific CFC. However, van Beek *et al*. (2013) showed that behavior-specific CFCs were not good predictors of other behaviors from the same domain. Thus, it is necessary to collect answers to several behavior-specific CFCs in studies and intervention programs that target multiple health behaviors simultaneously. Increased questionnaire length could cause an increased number of careless responses (Gibson & Bowling, 2020) as well as a loss of interest and increased burden experienced by the respondent, which, in its turn, could cause dropouts (Galesic, 2006). Therefore, if a more general CFC-health could predict or explain specific health behaviors almost as well as behavior-specific CFCs, it might be more beneficial to use it in studies and health intervention campaigns that target multiple health behaviors (Murphy *et al*., 2020). In such scenarios, using CFC-health might help avoid exhausting and irritating respondents with overly lengthy questionnaires.

Second, the finding that CFC-health had a stronger association with self-evaluated health behavior than behavioral frequencies revealed that health beliefs might be influencing the relationship that people's beliefs about the healthiness of their behaviors might deviate from actual health behaviors. We encourage further research on the effect of individual health beliefs and compensatory beliefs on the relationship between CFC and health behaviors. The results might suggest that health beliefs should be considered and targeted in health intervention programs.

Next, the finding that CFC-health/future had a stronger association with exercise behavior than the CFC-health/immediate suggests that the health communication emphasizing future health benefits of exercising might be more effective than minimizing immediate participation costs. However, because CFC-health is still an emerging construct, further studies on the relationship between CFC-health and health-promoting health-damaging behaviors are needed. Furthermore, we should be careful trying to extend our recommendations to other cultures. Thus, future research is encouraged to test CFC-health in different cultures.

The self-reported measure of health behavior is a limitation of the study (McAuliffe, DiFranceisco & Reed, 2007). Future research, using objective measures of behavior, such as diaries, is encouraged. Another limitation of the present study is that its survey design does not permit to establish causality between CFC and health behaviors, so future studies using an experimental design are encouraged. This study was performed on a university student sample that was rather homogeneous in terms of age; thus, we could not test for the effects of age on study variables and associations between them. We would like to encourage further research in this area. However, our results support the findings of the study by Murphy *et al*. (2020) which was performed on the general population; this suggests that the results can be generalized to the general population.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article:

Data S1. The results of the confirmatory factor analyses of CFC-general and CFC-health, and skewness and kurtosis.

Appendix S1. Health-specific Consideration of future consequences scale (CFC-Health) in English.

Appendix S2. Health-specific Consideration of future consequences scale (CFC-Health) in Norwegian.