MODELLING THE INFLUENCE OF AUTOMATICITY OF BEHAVIOUR ON PHYSICAL ACTIVITY MOTIVATION, INTENTION AND ACTUAL BEHAVIOUR.

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I would like to say thanks to:

ABSTRACT

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In research and in practise social-cognitive models, such as the theory of planned behaviour (TPB), are used to predict physical activity behaviour. These models mainly focus on reflective cognitive processes. As a reflective process, intention is thought to be the most proximal predictor to behaviour. Nevertheless, research suggests that the relation between intention and actual behaviour, the so called intention-behaviour gap, is moderate. Many health-related actions in daily life are performed repetitively and with minimal forethought. In contrast to social-cognitive theories, dual-process theories suggest that behaviour is based on both reflective and automatic processes. Recent research reveals that *automatic processes*, such as habit, can significantly explain physical activity behaviour initiation. One important finding was that automaticity of behaviour strengthens intrinsic motivation for physical activity. However, research has yet to explain the effects of automaticity of behaviour within the adolescent population, although lifestyle habits are strongly influenced during this period of the lifespan. The purpose of this study was to explore the role of automaticity of behaviour within the constructs of the theory of planned behaviour (TPB) and the self-determination theory (SDT), using the integrated model of SDT and TPB. A sample of 582 highly active adolescents aged 15-19 completed measures of behaviour regulation, attitude, intention, physical activity behaviour and automaticity of behaviour. Results show that automaticity of behaviour correlated with higher forms of self-determined behaviour. Two multiple regression analysis were conducted to explore the effects of automaticity of behaviour on both intentions and on actual physical activity behaviour. Results show that automaticity of behaviour is a significant explanatory factor for physical activity behaviour ($\beta = .10$, $p=.01$), even if controlled for reflective processes. Moreover, automaticity of behaviour was the second strongest explanatory factor for intentions ($\beta = .14$, $p=.00$). Secondly, a difference in behaviour regulation was found between the models on intention and physical activity. Intentions were best explained by intrinsic motivation ($\beta = .18$, $p=.00$), followed by automaticity ($\beta = .14$, $p=.00$) and attitudes ($\beta = .13$, $p=.01$). Actual physical activity behaviour was best explained by integrated behaviour regulation ($\beta = .24$, $p=.00$), attitudes and intention, while intrinsic motivation had no significant explanatory power on actual physical activity behaviour. The present findings support previous research, which suggests that automaticity of behaviour has a role in the explanation of physical activity behaviour. The discrepancy in behaviour regulation between intentions and actual physical activity behaviour is further discussed, as well the effects of automaticity on behaviour regulation, attitudes and intention. Finally, directions for future research and practical implications are presented.

Keywords: automaticity of behaviour, habit formation, integrated model TPB and SDT, behaviour regulation, intentions, physical activity behaviour, adolescence, youth athletes.

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1 INTRODUCTION

"We become what we repeatedly do."
Aristotle

Why are some people able maintain an active lifestyle and others are not? Social-cognitive models, such as the Theory of Planned Behaviour (TPB) (Azjen,1985) and the Self-Determination Theory (SDT) (Ryan & Deci, 2000), aim to answer this question by providing an understanding of why some people act the way they do or don't act the way they should. The theories explain that (exercise) behaviour is the result of a reasoning process, in which a different determinants (attitudes, social norms and perceived behaviour control) influences how an individual formulates an intention to act, which is believed to lead to actual behaviour.

So far, physical activity interventions based on these models are only moderately successful, especially in the long term. Most of the positive intervention effects tend to be short-lived: after six months people do not perform the behaviour anymore or perform it at a suboptimal level (Hillsdon, 2005). This may be due to the effort required to initiate intentional behaviour change, and the depletion of the limited cognitive control resources required to consciously sustain intentional action (Baumeister, 1998). Long term adoption to new behaviour is poorly understood.

However, the effects of repetition and automaticity of behaviour are not taken in account in the current leading social-cognitive theories. The above quote by Aristotle illustrates the importance of behavioural repetition. As Pavlov showed, behaviour repeatedly performed in a stable context gradually comes under automatic control. Much earlier James (1890) had already emphasized the importance of automatic behaviour "*as more actions we make automatic, as early as possible, as more useful actions we can perform.*"

Recently, the automatic processes that underlie behaviour have gained more research attention. In support of this view, the dual process theory of Bargh (1999) states that behaviour is shaped from both reflective and automatic processes. He characterised four factors of automatic behaviour: low awareness, low impact of rational intentions, high

efficiency and low controllability. Recent research suggests that longterm adoption can be increased by the development of habits. Habits can be defined as an automatic behaviours patterns which, through repeated performance in the presence of stable contextual cues, have become automatic responses to those contextual cues (Oulette, 1998).

Lally and Gardner (2013) recently shed new light on habit formation in the physical activity domain. Firstly, they suggest that habit formation in the physical activity domain is measured best by automaticity of behaviour. Secondly, they suggest that action initiation in particular can lead to automaticity of behaviour development (Lally & Gardner, 2013). Automaticity of behaviour can be explained as the degree of 'reflective thinking' people need to make the decision to go exercising. Carrying out new behaviours requires high levels of deliberate planning and cognitive awareness and as such, decisions will be made with a strong rational underpinning. Well-practised decisions are made more rapidly, in reaction to contextual cues and thus rational reasoning becomes less important. This can be an advantage because it saves valuable cognitive energy. Moreover it can shield action initiation from fluctuations in motivation (de Bruijn & Rhodes, 2011; Gardner & Lally, 2013). These characteristics can add to the long-term adherence to physical activity behaviour.

Up to 40 percent of our daily life consists of habitual behaviour (Lally, 2010). Since habits are performed under low awareness, it can be hard to change these automatic behavioural patterns. A better understanding about the characteristics and effects of automaticity of behaviour can help to increase adherence and long-lasting change in health behaviour.

Increasing long term adherence to physical activity is important as insufficient physical activity remains a worldwide treat to the public health. An updated publication of the World Health Organization in February 2014 revealed that 3.2 million people die due to physical inactivity on a yearly basis, which makes it the fourth highest risk factor of death worldwide. Currently, one in three adults do not meet the required levels of daily physical activity (WHO | Physical activity, 2014). In the past decade, a number of researchers have presented several models to explain and predict physical activity behaviour; motivation and long term adherence to physical activity behaviour, however,

remains low. A better understanding about habit formation might add to the understanding of long term health-behaviour change.

Additionally, adolescents between 14 and 19 years of age show high dropout from organized sports (Fraser-Thomas, Côté, & Deakin, 2008). The period of adolescence is characterised by rapid and significant changes in life. These changes can have enormous effects on the behaviour regulation, attitudes and intentions towards sports (Iannotti, Kogan, Janssen, & Boyce, 2009; Landry & Driscoll, 2012). Habitual behaviour is less susceptible for fluctuation in motivation or changes in intentions. And might add to sustained levels of physical activity trough the lifespan, and lower drop out during the adolescent's years. A better understanding about the role of automaticity on physical activity behaviour and the prior reflective processes, might add to effective strategies to prevent adolescents from drop out from sport.

Therefore, this study examines the influence of automaticity on *reflective processes* and on *actual behaviour* in a highly active adolescent sample.

2. LITERATURE REVIEW

The first part of this literature review, will review the theory about *motivation, changing behaviour* and *adherence to physical activity*. The second part will focus on the role automatic processes of behaviour and habit formation, and which role this processes might play in the adherence to physical activity behaviour.

2.1 Key terms:

Motivation is defined as the forces that give *direction* and *intensity* of effort. This force can be either internal or external (Weinberg & Gould, 2011).

Behaviour is the individual's observable response in a given situation with respect to a given target (Ajzen, 1985).

Adherence is the level of participation in a behaviour regime once a person has agreed to undertake it (Weinberg & Gould, 2011).

Habit: A strong mental association between the situation and action, whereby the action is automatically enacted as the situation/context shows up (de Bruijn 2010, 2011;Verplanken & Aarts, 1999; Wood & Neal, 2009).

Automaticity*:* the degree of which behaviour is initiated from implicit systems (Gardner, 2012).

Action initiation*:* The moment that intentions are translated into actual action. It is important to note that this study focus on the action initiation, which is seen as the part of behaviour that becomes under automatic control, not the physical activity itself. (Verplanken & Melkevik, 2008; Verplanken, 2006)

2.2 Motivation

People are motivated by either external factors, such as obtaining rewards, or internal *factors,* like interest, curiosity and pleasure. The *Self Determination Theory* (Ryan & Deci, 2000) has been extensively used in motivation and behaviour research. It is a multi-dimensional framework, with several sub theories and aims to explain motivational regulation in human behaviour.

Central in the theory is the distinction in quality of motivation, depending on the source of regulation. People base their behaviour on different motives, which determine if the

behaviour is regulated external or internal. The SDT consists of six forms of behaviour regulation, which are organized on the continuum of motivation:

Amotivation	Controlled Extrinsic Motivation		Autonomous Extrinsic Motivation		Intrinsic Motivation
	External Regulation	Introjected Regulation	Identified Regulation	Integrated Regulation	

Low self-determination ←——————————————————→ High self-determination

Figure 1: The continuum of behaviour regulation

As can be seen in figure 1, the continuum of motivation varies from low to high self-determination. Self-determination can be explained as the freedom of choice people perceive towards (executing) the behaviour. How more freedom of choice is perceived, how more self-determined the behaviour is. The lowest form of self-determined behaviour is amotivation: people have no motives towards engaging in the behaviour. The other extremity on the continuum is *intrinsic motivation*: people find joy and satisfaction in the activity itself. The drive to do the behaviour comes from within the person. Self-determined motivation is related to positive outcomes on behaviour, cognition and emotions. Motivation can be considered as a continuous factor, varying from low to high self-determination. The theory distinct six types of regulations.

If behaviour X is performed to obtain Y, the regulation is *external*. Motivation comes from external factors, such as punishment, the approval of others, better health, or fulfilling one's own goals. There are two categories in regulation - *controlled* and *autonomous*. Each category captures two forms of regulation. *Controlled extrinsic motivation* occurs when behaviour X is performed to obtain Y, and Y is a factor outside control of the person. Thus, external pressure is necessary to perform behaviour X. If the external pressure falls away, there is a high change that people stop performing the behaviour. The theory distinct two forms: external regulation and introjected regulation. The less self-determined form is e*xternal regulation:* the regulation is driven by obtaining reward or avoiding punishment. This is the case if the motive of coming to practise is avoid punishment, for example from the parents. The second form is *introjected regulation* – behaviour is driven by receiving approval/avoiding disapproval from others and/or avoiding feeling of guilt. For instance, the motive to come to practise is to please the parents.

The second subcategory in external regulation is *autonomous motivation* – behaviour X is performed to obtain Y and Y in a factor under control of the person. For example, motives to come to practise are based on the wish to become fit. Practise (behaviour X) lead to a better fitness (outcome Y). Autonomous motivation covers *identified* and *integrated regulation. Identified motivation* occurs if a person regulates his behaviour because it is personally important for him. For instance, a person thinks that being healthy is important for the quality of his life, so he does sports regularly to stay healthy. The most self-determined form of extrinsic motivation is *integrated motivation* - the behaviour is an important aspect of someone's life and identity. Behaviour is regulated because it is part of the 'identity'. Regarding sport and exercise adherence, these two forms of autonomous motivation are related to more stable behaviour, long-term adherence and higher enjoyment (Deci & Ryan, 2012; Fortier, Duda, Guerin, & Teixeira, 2012; Gunnell, Crocker, Mack, Wilson, & Zumbo, 2014; Vlachopoulos, Karageorghis, & Terry, 2000).

Intrinsic motivation is the highest form of self-determined behaviour. Behaviour X is performed to obtain X. The activity is done for its own sake, the activity is perceived as ´fun´. In the light of long-term adherence and adoption, this is the most stable form of motivation.

Internalization of motivation

The SDT states that regulation can swift from low to higher levels of self-determined motivation. This process is called *internalization* of regulation. The *basic psychological needs sub-theory* states three basic psychological needs are those that direct human motivation: *autonomy, relatedness* and *competence*. Intrinsic motivation only occurs if all three basic needs are fulfilled. The level of need fulfilment determines the level of self-determined behaviour. Low levels of perceived autonomy, relatedness and competence will lead to low self-determined forms of regulation on the continuum. If the environment provides opportunities to fulfil the three basic psychological needs, regulation can swift to higher self-determined forms. This will have positive effects on behaviour, cognition and emotion, which will results in experience the activity as pleasant (Deci, Eghrari, Patrick, & Leone, 1994; Walker, 2008).

The *autonomy need reflects* the degree of control a person perceives over the choice. For example, if Hasan shows up to practise because his parents force him to do so, he perceives no freedom of choice. He will go because his parents tell him so, but if his parents do not force him anymore, his motivation will drop. People have the need of control over their choices and action. An autonomy supportive environment gives people choice over the activities they want to do. The theory explains that people with controlled forms of exercise motivation will have more problems with long-term adherence. More autonomous forms of motivation lead to higher enjoyment, and so to higher adherence *(*Hagger et al., 2002, 2007*)*.

The second basic need is c*ompetence*, which *reflects* the feeling of having the skills and ability to perform the behaviour well and acquire skills. If people want to adopt a new behaviour, they need to have a certain believe in their own abilities to do so. Thus, learning and mastering skills is important to fulfil this need, thus motivate people. Succes experience and improved skill level will fulfil his need of competence.

The last basic need is *relatedness* and reflects the degree in which a person feels socially related towards the behaviour. Behaviour is often adjusted to the opinion of significant others. A research of exercise adherence in adult's exercisers revealed that people who experiences higher relatedness, adhered better to physical activity programs (Hagger & Chatzisarantis, 2007). Stimulating social support networks, significant others and the social aspect in sport can help people to increase relatedness towards the activity. (Broeck, Vansteenkiste, Witte, Soenens, & Lens, 2010).

'I do sports because it is fun', reflects an intrinsic behaviour regulation. This regulation is associated with the highest adherence number, and positive outcomes on behaviour, cognition and emotion. The SDT propose that motivation can be either external or internal, depending on the level of basic need fulfilment. If all three basic needs are fulfilled, the regulation will be intrinsic. It is essential to create a supportive environment, which offers opportunities to fulfil these basic psychological needs. If choice in activities is offered (autonomy), sport of fitness skills increase (competence) and significant other persons such as parents have a positive opinion towards the behaviour (relatedness), it is possible to move towards higher self-determined forms of regulation. This process is called *internalization of behaviour*.

Strengths and limitations

The *Self Determination Theory* (Ryan & Deci, 2000) has a strong basis of research evidence in the field of physical activity. Plotnikoff (2013) recently examined the effectiveness of social-cognitive theories in explaining physical activity behaviour in adolescents. According to Plotnifkoff's meta-analysis, the self-determination theory explained 37 percent of the variation in physical activity behaviour in adolescents, and this was the highest score compared to other social cognitive theories (Plotnikoff, Costigan, Karunamuni, & Lubans, 2013). Empirical research reveal that autonomy supportive climate stimulate long-term adoption of behaviour (Chatzisarantis & Hagger, 2009). Nevertheless, one major drawback of the self-determination theory is the lack of explanations in how motivation is translated into action. As Hagger and Chatzisarantis (2008) state: "*the mechanisms which foster long term adoption to the behaviour are still poorly understood, and require more research*".

2.3 Models of behavioural change

Numerous social cognitive theories, such as Bandura's self-efficacy theory (Bandura, 1977), the theory of planned behaviour (Ajzen, 1985) and the health action approach (Schwarzer, 1992) are used to predict physical activity behaviour. *Social-cognitive theories* are mainly grounded in learning theories. Learned experiences from the past will predict new behaviour. Therefore, we need to understand how our experiences shaped our current behaviour. In cognitive psychology learning is seen as a reflective process, thus changing behaviour should focus on reflective processes. Our attitudes, the opinion of significant others and the degree in which we believe have control over the behaviour determine if we act out a behaviour or not.
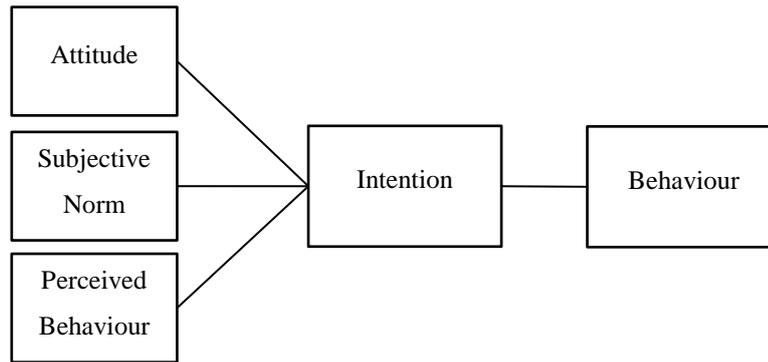
Figure 2: Theory of Planned Behaviour (Ajzen, 1985)

Ajzen's *Theory of Planned Behaviour* (1985) is schematically described in figure 2. The theory assumes that *intentions* are the most proximal key towards behaviour. Intentions can be described as how hard a person is willing to try and how much effort people plan to exert towards the desired behaviour. Intentions are formed by three factors: *Attitudes* refer to the degree to which exercise is positively or negatively valued, in which both cognitive and affective evaluations are relevant. *Subjective norm* refers to the perceived social pressure from significant others. Whereas p*erceived behavioural control* captures how easy or difficult the person judges the behaviour and how much control they have over the behaviour. In some cases, behaviour control can lead directly to behaviour, without the need of forming intentions. Therefore, the behaviour should not be under complete volitional control; secondly, their perceptions of control must be realistic (Duncan, Rivis, & Jordan, 2012; Hagger & Chatzisarantis, 2009).

To summarize the theory of planned behaviour, it can be said that strong intentions is the key to new behaviour. Behaviour is guided by three kinds of beliefs: beliefs about the likely outcome and evaluation of the behaviour, about the expectation of others, and about the motivation to comply with these beliefs. Intentions can be strengthened by attitudes towards the behaviour (the beliefs a person hold about the behaviour), subjective norms (the expected normative norms by others) and perceived behaviour control (how much belief a person has that he can successfully carry out the behaviour). The TPB offers a structured approach to understand change of behaviour. The theory has been successful in explanation of intentions and initiation of new behaviour, but less is discussed about the adherence to behaviour.

Strengths and limitations

There is a large volume of published studies describing the effectiveness of the *Theory of Planned Behaviour*, for health behaviour in general and physical activity in specific (Ajzen, 1985; Armitage & Conner, 2001; de Bruijn & Rhodes, 2011; Plotnikoff et al., 2013; Webb & Sheeran, 2006). The effect size of *intention* on actual *behaviour* is .36; in other words 36 percent of the variance in physical activity behaviour is explained by intentions (Hagger & Chatzisarantis, 2002; Plotnikoff et al., 2013; Webb & Sheeran, 2006). Thus, effect sizes are lower if an objective measure for physical activity behaviour is used. I*ntention*s explain 36 percent of the variation in physical activity behaviour, which means that 64 percent of behaviour remains unexplained. The term i*ntention-behaviour gap* explains the missing link between intentions people have and their actual behaviour (Hagger & Chatzisarantis, 2009). The theory does not explain the complex process of translating intentions into behaviour. The intention-behaviour gap will be discussed in more detail in section 2.6.

The integrated model of the Self-determination theory and the Theory of planned behaviour

Both SDT and TPB are strong theoretical frameworks to predict physical activity. Plotnikoff recently conducted a meta-analysis measuring the predictive power of the several social-cognitive theories to predict physical activity behaviour in adolescents. Results reveal that the SDT and TPB had the strongest predictive power (Plotnikoff et al., 2013). However, both theories have their strengths and limitations. Thus, Chatzisarantis and Hagger (2009) proposed an integrated model of the Theory of Planned Behaviour and the Self Determination Theory, which combines the strengths of both theories, see figure 3. The SDT explains the motivational orientation, but does not represent how this motivation is converted into intentions and actual behaviour. While the theory of Planned Behaviour is successful in explaining how intentions are build, it does not explain the origins and quality of the antecedents of the behaviour.
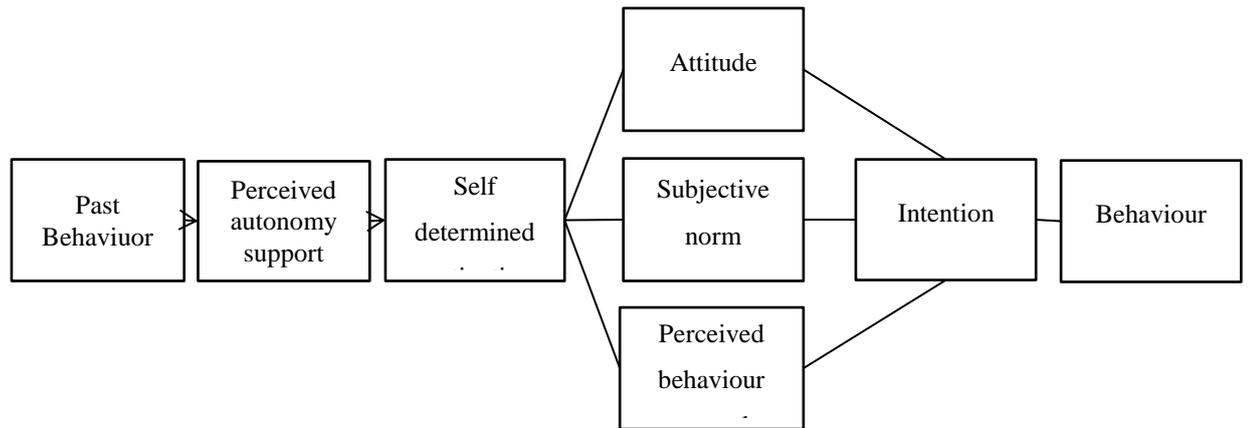
Figure 3: The integrated model of SDT and TPB (Chatzisarantis and Hagger, 2009)

In the integrated model (see figure 3) SDT constructs are distant predictor of behaviour, while TPB construct are proximal predictors.

The model controls for the influence of past *behaviour.* Successful past behaviour is the strongest predictor of future behaviour. To prove the effectiveness of the cognitive processes, past behaviour is included in the model as control factor.

The *perceived autonomy support* is a construct of the SDT. It explains to which degree the environment supports the fulfilment of the three basic psychological needs: a free choice to be engaged in the behaviour (autonomy), the need of social interaction and social acceptance (relatedness) and the need of believing in own abilities (competence). If all three needs are fulfilled, the motivation is self-determined and no pressure from outside is needed to motivate people. If the needs are not fully fulfilled, people only perform the behaviour X if they obtain Y. As long as the person itself values Y, the motivation is autonomous. This autonomous form of behaviour regulation, as part of the Self-determination theory, is strongly connected towards TPB constructs attitudes and *perceived behaviour control.* Those connections will be explained in more detail:

The effects of autonomous motivation (SDT) on attitudes (TPB)

Having autonomous motivation (SDT) is correlated with positive attitudes towards the behaviour (TPB). The motives people base their behaviour on will influence the form of regulation, which will affect the opinion people have about the behaviour, *the attitude.*

Attitudes are the personal beliefs and opinions a person has towards a behaviour, which are either positive or negative. These positive attitudes (TPB) will be reflecting back in autonomous forms of behaviour regulation (SDT). For instance, 'I exercise because it helps me release stress, so it helps me to relax' reflects on an identified thus autonomous form of behaviour regulation. Exercising (behaviour X) leads to a related feeling (outcome Y), which is important for the person. In terms of attitudes (TPB), the person would perceive exercise as helpful. Attitudes are a strong predictor towards behaviour. A growing body of literature in the field of sport and physical activity motivation reveals that autonomous forms of motivation (SDT) and attitudes (TPB) are strong predictors of behaviour. Especially in the light of long-term adherence, those constructs play a significant role (Bartholomew, Ntoumanis, & Th⊘gersen-Ntoumani, 2009; Duncan, Hall, Wilson, & Jenny, 2010; Jõesaar, Hein, & Hagger, 2012; Thøgersen-Ntoumani & Ntoumanis, 2006).

The effects of autonomous motivation (SDT) on perceived behaviour control (TPB).
As pointed out in the introduction, *motivation* is defined as the direction and intensity of effort towards a goal. If motivation is self-determined, people perceive control over their behaviour. The person freely chose to engage in the behaviour. Their motives are based either for the sake of the activity itself (intrinsic) or to obtain a personal valued goal (autonomous regulation). If behaviour is *external regulated* the behaviour is performed for others (such as teacher, parents, coaches, doctors, partners), the person feels that others expect him/her to perform the behaviour. The person feels external control over his decision to go. Thus, the form of behaviour regulation (SDT) explains if the control is external or internal, and will thus explain about the intensity of the control. For example, people can be highly motivated to do sports in order to get approval from their partner. They experience high control in their behaviour, but this control is external. If this external pressure disappears, for example if the partner does not value sports anymore, the motivation will drop.

Thus the motives people base their behaviour on, will affect their opinion about how much *control* they have on the behaviour. The theory of planned behaviour states that *perceived behaviour control* is an important predictor of intention, as well on actual behaviour. The integrated model proposes that *autonomous behaviour regulation* is related to higher perceived behaviour control. Thus, will lead to stronger intentions and

lead to stronger behaviour. Whereas, non-autonomous regulation is negatively related to perceived behaviour control, and therefore will lead to lower intentions (Araújo-Soares, 2009; Bandura, 1977; Dishman, 1990; Dishman, 1994; Hagger, Chatzisarantis, & Biddle, 2001; Woodgate, 2005).

Summing up, the theory of Planned Behaviour and the Self-Determination Theory are two extensively used theories in explaining physical activity behaviour. Both models have their limitations and strengths; the integrated model combines the strengths of both theories into one model. In the integrated model, self-determined regulation is linked to attitudes and behaviour control. The theoretical framework (see figure 3) of this thesis research is based on the integrated model. (Chatzisarantis and Hagger, 2009)

2.4 The intention-behaviour gap

The described model states that intention is the most proximal predictor of behaviour. The term intention-behaviour gap explains the difference between intentions (what plans people have in their mind) and their actual behaviour (actual actions) (Sniehotta, Scholz, & Schwarzer, 2005). Having good intentions is no guarantee for good behaviour. Thus, intentions to change a habitual lifestyle are seldom successfully translated in actions (Sutton, 1994). Social cognitive theories propose that intentions are the strongest and most proximal predictor of behaviour. Empirical research underlines this finding but also shows that the relation is rather modest (Johnston, Johnston, Pollard, Kinmonth, & Mant, 2004). Therefore, the concept of only behavioural intentions alone is not sufficient to understand lifestyle changes. The intention-behaviour gap is the missing link in understanding *adoption* of health behaviour (Orbell & Sheeran, 1998). Hagger (2013) states that *self-regulation* is needed to translate intention into behaviour.

Self-regulation

Carrying out intentional behaviour requires self-regulation. Self-regulation refers to the efforts to avoid spontaneous learned, habitual or innate responses to situational cues and act on the intentional way. Sheeran (2005) describes that intentions on itself may lack specificity and conceptualization into the circumstance of someone's daily life. Schwatzer (2005) proposes that forming intention is a different process from implementation of intentions. This process has two phases; the *motivational phase-*

formations of intentions- and the *volition phase* –implementing intentions into the daily life. The volition phase requires planning and decision making skills (Webb & Sheeran, 2006).

Implementation intentions (Gollwitzer, 1999) and *action planning* (Sniehotta et al., 2005) are concepts that reflect on this statement. The aim of *action planning* is to describe in detail when and how intentions of behaviour are carried out in someone's daily life. By describing *when*, the behaviour is to situational parameters, such as time of the day. By describing w*here,* a cue is placed in the environment, which will unconsciously remind of the behaviour. With describing *how,* people become aware of the range of actions that needs to be accomplished (e.g. prepare running clothes day before, put on running shoes etc.). This will create a so-called blueprint in the mind, and prepare people for all the steps they have to take to successfully translate intention into behaviour.

The *decision-making* process plays an important role. Early methods, such as the "The decisional balance sheet" (Wankel, 1984) outlines the positive ('pros') and negative ('cons') aspects of exercise. This can be compared to a 'cost-benefit' analysis about the behaviour. An experiment showed that exercisers using the decisional balance sheet attended 84 percent classes, compared to 40 percent of the control group (Hoyt & Janis, 1975; Wankel, 1984).

Change *process models*, such as the trans-theoretical model of change (Prochaska & Velicer, 1997; Prochaska & Marcus, 1994) or the health action-process approach (Schwarzer, 1992; Weinstein, Rothman, & Sutton, 1998), adopt the different phases of change into a new the theoretical framework. In the trans-theoretical model, change has been described as a 5-phase process; the first step is pre-contemplation; people have no intention to do exercise. Followed by contemplation; people intent to change within the next 6 months but are not acting yet. The third phase is preparation; there is readiness to action, some physical activity is done but not on a stabilized level. The second last step is action; physical activity is done at a regular basis, nevertheless in this phase the risk of drop out is high (over a 50% of the people who start with a physical activity program, drops out within the first six months). If no drop out occurs, the maintenance stage is entered. In this stage, motivation and intention need to be adjusted and cultivated

towards long-term adoption (Prochaska & DiClemente, 1993; Nigg & Courneya, 1998). Those models have been becoming more popular throughout the last years. Nevertheless, some researchers state the change process models must be seen as an addition of the theory of planned behaviour. They describe the readiness of change, which can be seen as the strengths of an intention.

The failure of self-regulation

Self-regulation − the effort to act on intentions instead of habitual responses − requires personal cognitive energy resources, in the form of self-awareness, planning and remembering intentions. Failure or self-regulation often occurs if personal cognitive resources are low; in situation of stress, in social events or when strong habitual behaviour is involved. Schwartzer (2005) proposes three main problems with the failure of self-regulation: Action initiation, overcoming barriers to engage in the behaviour and persistence of effort over time.

   1.   *Action initiation*

Good intentions are easily forgotten in daily life. Social-cognitive theories tend to focus on the rational planning and decision making in order to examine a new behaviour. Self-regulation requires personal cognitive resources. Coping with daily hassles, such as stress, fatigue and mood change will lower personal cognitive resources. Failure of self-regulations occurs if levels of personal cognitive resources are insufficient. In this situations people tend to fall back in their old routines, which requires less cognitive energy. In more detail, the *prospective memory (PM)* is in charge of remembering intentions (Brandimonte, Ferrante, Bianco, & Villani, 2010; Smith, 2003). The prospective memory, as part of the working memory, has a limited capacity. During the day, it is easily filled up other cognitions, intentions and daily life hassles. If personal cognitive resources decline − in case of stress or fatigue − intentions, such as doing more physical activity, are easily forgotten.

The prospective memory is responsible for remembering our future actions and intentions. This prospective memory depends on cognitive resources, which means that in situation of stress or fatigue the recourses decrease. Intention can then easily be forgotten. In the literature there are some strategies that can help intentions to stay stronger in the prospective memory. For example, Brandimonte (2010) explains that the

prospective memory works better, if the intention is based a pro-social motive. If other person is involved, intentions remain clear in our memory (Brandimonte et al., 2010).

Action planning is a detailed description of how, where and when the behaviour will be carried out. This planning creates links between goal-directed behaviours to certain environmental cues. These cues can trigger the initiation of action without conscious intent. Several researches show, that individuals who create those plans are faster to initiate and more successful on the long run in translating their intentions into actual behaviour, compared to individuals without action plans. Action plans are effective in the physical activity setting, but no research yet has examined the long-term effects of action planning (Sniehotta et al., 2005)

2. *Overcoming barriers to carry out the behaviour*

"I don't have enough time" is the most called barrier to be engaged in physical activity (Biddle & Smith, 2008). Obstacles can be tackled by constructs as coping planning and implementation intentions (Gollwitzer, 1999; Sniehotta et al., 2005). *Coping planning* is a barrier-focussed self-regulation strategy. It created a mental link between risk full situations and suitable responses. A person can create a plan to protect good intentions from distractions and changing situations. For example if 'bad weather' is a barrier to go running, a coping plan can be "if it rains, I will not sit down and forget my plans, instead I will do a workout at home". This will strengthen the intention-behaviour relation. The change of actual acting is bigger, since people have a concrete plan on how to react on the changed situation. This leaves less space for deliberating and weighing pro and cons to carry out the behaviour. Concepts like action planning, coping planning and implementation intentions were effective in bridging the intention behaviour gap (Gollwitzer, 1999; Sniehotta et al., 2005).

Adherence can be defined as the level of participation in a behaviour regime once a person has agreed to undertake it. Characteristic for physical activity programs is the low adherence, especially on the long term. The number of people that initiate physical activity has increased over the last 20 years; however, the number of dropouts remained stable. Over a 50 percent of the people who take up physical activity, drops out within the first six months. Moreover, 40 percent will experience at least one relapse, 20 percent had experienced three or more relapses (Barr-Anderson, Young, & Sallis, 2007;

R Dishman, O'Connor, & Tomporowski, 2013). Long-term adoption of physical activity is still poorly understood. One of the greatest challenges facing researchers in the field of health-behaviour change is to understand how to accomplish long-term adherence and prevent relapse. There is a clear need to use theoretical frameworks to study relapse behaviour, as previous research studying relapse in exercise settings has been mainly a-theoretical (Fortier et al., 2012; Thøgersen-Ntoumani & Ntoumanis, 2006).

The difference between willpower and self-regulation

Willpower is the ability to override feelings and emotions to accomplish a goal, and is the cognitive energy to change a learned or habitual response. For example, a person who plans to go running over work might have to override feelings or tiredness. Thus, recent findings from the neurosciences reveal conflicting effects of willpower. If people lack positive motives and attitudes towards the behaviour, the chance is high that reflection over the behaviour will be negative. This will lead to low satisfaction with the behaviour. If people are confronted with the decision to do the behaviour, the mental memory will remember the negative feelings and emotions that came with the behaviour. Thus, more and more willpower is needed to override those negative feelings. These levels of willpower are highly demanding on the personal cognitive resources. Performing behaviour purely from willpower will have positive short-term effect, but negative effects on the long-term (Dimmock & Banting, 2009; Graham, Bray, & Martin Ginis, 2014).

Action planning – a detailed description of how, where and when the behaviour will be carried out - creates a mental link between the behaviour and a particular event. This places the desired behaviour in the context of the daily life, which will test the feasibility of intentions. Coping planning - a barrier-focussed self-regulation strategy - helps to protect the actual *decision-making* against distractions and stressful events. People thought beforehand how to react on a challenging situation. Creating this link will help people remember their intentions as soon as the risk full event occurs. Verplanken (2008) states that translating the intention to do physical activity into actual behaviour are often depended on the actual *decision* to go exercising. It is important to note not the activity itself should become automatic, but only the decision to go. (Gardner & Lally, 2013; Graham et al., 2014; Lally, 2010; Verplanken, Aarts, van

Knippenberg, & Moonen, 1998; Verplanken & Orbell, 2003; Verplanken & Melkevik, 2008).

This first section has reviewed the key aspects of overcoming the intention-behaviour gap. Forming intentions is the *motivational phase*, while planning to carry out those intentions is the *volitional phase*. The motivational phase is covered by the social-cognitive theories. There are three main issues within the volitional phase, which together form the intention-behaviour gap: action initiation, overcoming barriers and long-term persistence of effort. Self-regulation– the effort to act on intentions instead of habitual responses - is needed to act on intentional behaviour. Failure of self-regulation is caused by limited memory capacity, insufficient personal cognitive resources (caused by stress, fatigue and mood change) and inflexibility towards changed situations. Planning – creating a mental link between the behaviour and a situational context – is a self-regulatory skill, which can be seen as a underlying construct of successful methods or strategies, like action planning (creating plans on how to execute the intended behaviour; task orientated planning), coping planning (planning how to overcome barriers; distraction orientated planning) and implementation intentions (stating when and how). A growing research body affirms that planning methods strengthens self-regulatory skills. Willpower – the energy to override feelings and emotions in order to act on intentions – has conflicting effects on behaviour. While it has positive effects on the short term, it may have negative effects on the long term.

Nevertheless, recently researchers suggested "future behaviour change efforts might do well to give greater consideration to automatic processes which influence action". Gollwitzer (1999) states that *planning* has both reflective and *automatic features.* These automatic features were highlighted as underlying constructs by several authors (Hagger & Luszczynska, 2013; Sheeran et al., 2005). In more detail, Gollwitzer states that action planning is the process of linking goal-directed behaviours to certain environmental cues. These cues can trigger the initiation of action *without conscious intent*. This underlines the role of *automatic processes* in initiation and adoption of behaviour (Gollwitzer, 1999).

2.5 Automatic processes in physical activity behaviour

The dual processes approach

Dual processes approaches become increasingly popular in psychology (Evans, 2013). The theory is based in the idea that two different cognitive systems are responsible for the reasoning our behaviour. System 1, also known as implicit system, is old in evolutionary terms and has shared characteristics with other animals. It consists of a set of autonomous behaviours and domain-general learning. System 2, also known as explicit, is 'young' and restricted to humans, permits abstract thinking and hypothetical reasoning. This system is constrained by the capacity of our working memory, and in general slower compared to system 1. Dual process theories state that there are two minds in one brain, which both compete for the control over our actions.   The characteristics of both systems are explained in figure 4.

Figure 4: The characteristics of two systems (from Evans, 2003):

Automatic system (system 1)	Reflective system (system 2)
Unconscious reasoning	Conscious reasoning
Implicit	Explicit
Automatic	Controlled
Low Effort	High Effort
Large capacity	Small capacity
Rapid	Slow
Default Process	Inhibitory
Contextualized	Abstract
Nonverbal	Linked to language
Includes recognition, perception, orientation	Includes rule following, comparisons, weighing of options
Independent of working memory	Limited by working memory capacity
Non-Logical reasoning	Logical reasoning

As can be seen in figure 4, System 2 is responsible for our consciousness and rationalized reasoning of our behaviour. System 1 works 'un-conciseness', only the 'end-product', e.g. the actual behaviour is placed in our consciousness, while the reasoning behind stays unconscious. Both systems 'fight' over control over our decisions and actions. System 1 is faster, but system 2 can override system 1 by

conscious rational reasoning. A comprehensive explanation can be found in the article of Evens (2003). For neuropsychological research underlining the dual-process theory, evidence from experimental research is found by Goel (Goel, 2007). Secondly, Bargh (2006) describes how the unconscious mind influences judgements, decisions and reasoning of our behaviour. In the last years, a range of books has been written on the topic. (Bargh, 1996, 1999, 2000, 2008; Evans, 2003; Goel, 2007; Kahneman, 2011; Peters, 2012)

This theories states that two 'systems' involved in decision making. System 1 is more automatic, non-logic, fast, and works with default processes. System 2 is responsible for conscious and rational reasoning, and it is slower and has less resources compared to system 1. System 2 is able to inhibit with system 1 by abstract and hypothetical thinking, but is restricted to working memory capacity. By planning – forming mental links between behaviour and the context – a mental representation of the context is created in which the intention is carried out. This mental representation is better accessible for system 1.

Rothmans' 2x2 framework of behaviour change

Based on the dual-approach theories, Rothman, Sheeran and Wood (2009) developed a 2x2 matrix for health behaviour change. Action control is either by a reflective or automatic system. They distinguish two stages of behaviour change: initiation and adoption. Each stage has different strategies, on the reflective and automatic level. So far, the framework has been only used for nutrition research, and not yet for physical activity.

Action control	Stage of behaviour change	
	Initiation	Maintenance
Reflective (system 2)	Theory of Planned Behaviour Forming intentions	Self-determination theory Satisfaction with behaviour
Automatic (system 1)	Implicit attitudes	Habit formation

Figure 5: the 2x2 matrix of behaviour change. Source: Rothman, Wood and Sheeran (2009)

From a reflective (system 2) perspective, it can be said that in the initiation stage people build the intention to adopt a new behaviour. Their intentions are based on future beliefs about the own ability, and the positive outcomes of the behaviour. Thus, their intentions are abstract. In the maintenance stage, people start to reflect on their experiences with

new behaviour, and access how satisfied they are with the results. People base their decision on questions like; are the results sufficient satisfying to continue? Are the benefits higher as the costs? If people move from the initiation to the maintenance stage, their attention swifts from future expectations towards reflection over the past behaviour. Satisfaction is the key towards continuation of behaviour and therefor as an important key to adoption of behaviour (Rothman, Sheeran, & Wood, 2009; Weinstein et al., 1998).

Habit formation

A habit is a strong mental association between the situation and action, whereby the action is automatically enacted as the situation/context shows up (de Bruijn 2010, 2011; Verplanken & Aarts, 1999; Wood & Neal, 2009). They will develop when people repeatedly respond in a stable context. An associative connection in the memory between the cue (a person, time of day, sign or place) and the context is established. As the context occurs again, it will automatically activate the link between the context and the behaviour. The stronger the link in the memory, the less accessible are other action in the same situation. This automatic reaction is very quick, and will bypass *reflective action control* (Rhodes & de Bruijn, 2010b). In practice this can mean that if a person starts exercising every Monday night straight after he come home, he creates a link between the situation and the behaviour. The stronger this connection between coming home on Monday and exercising becomes, the less accessible other actions are accessible in the memory. This will decrease deliberating about the decision to go or not (Ouellette & Wood, 1998; Sheeran et al., 2005; Wood & Neal, 2007).

Habit formation is associated with maintenance of behaviour (Lally, 2010). None of the present social-cognitive health theories considers the important role or repetition of behaviour, although it is often the cumulative effect of repetition that leads to the detrimental effect. Eating fatty food once in while will not have the detrimental effects, eating it repetitive could have detrimental effects. The same counts for the positive health effects of physical activity, the positive health effects are dependent on repetition of the behaviour. Lally & Gardner (2013) argue for habit formation to increase long-term adoption of health behaviour.

Habits have three characteristics. The first characteristic is *low awareness.* The initiation of habitual actions happens with low awareness, and thus the action decision

is stored vague in the memory. Automatic action does not require self-regulation, and moderated the intention-behaviour relationship. Thus, automatic actions are not depended on system 2 and its restricted working memory. The second characteristic is the *lack of emotion*. The more often behaviour is repeated, the less emotion the action evokes. This does not mean there are no emotions present if people do exercise habitually, but the decision to go does not evoke emotion on itself. A person who starts running for the first time in five years will experience much more emotions by making the decision to go exercising (worries about how to prepare, where to go, what others will think of her while running), compared to a person who runs for years on a regular basis. The decision to go and its action became automatic. The last characteristic is the *context related* reaction. Habit is an automatic link between a context and behaviour. If the context shows up, the behaviour is automatically activated. This automatic link develops if the same decision is repeated in a stable context (Dean, 2013).

Forming intentions for behaviour can be labelled as reasoned thinking; hence it is a system 2 activity. Acting on intentions means that system 2 has to be constantly active, which requires self-regulation. The failure of self-regulation can thus be defined as the moment that system 1 takes over the control from system 2. System 1 will return back to default processes and so goes back in habitual behaviours. The risk is especially high if working memory is limited because of stress, fatigue or high cognitive demanding situations (Dombrowski & Luszczynska, 2009; Benjamin Gardner, 2012; Kahneman, 2011).

As Gardner (2012) stated, initiation of physical activity is highly dependent on the decision to go exercising. Reasoning and decision making are influenced by both systems. System 1 decisions are non-logical and based on context, recognition and perception. Decisions are made depending on how successful, helpful or pleasurable the behaviour has been experienced in the past. Negative experiences or implicit attitudes will be activated as soon as a person makes an attempt to take up new behaviour. System 2 has the power to override the decision of system 1, by rational reasoning. However, this requires high levels of working memory. The automatic system (system 1) has a much larger capacity and is not restricted to working memory. System 2 has less capacity and is depended on working memory, but it can override the actions of system 1. In other words, behaviour based on automatic processes is faster. But rational

behaviour can interrupt in automatic processes. If behaviour is fully based on willpower, system 2 needs to override system 1 all the time. Thus, all the mental energy to perform the behaviour is using the scare system 2 cognitive resources. A new behaviour can be initiated on willpower, but behaviour will not be adopted if it is fully based on willpower (Peters, 2012).

From this point of view habits offer an opportunity for different stages in the adoption of exercise behaviour. If behaviour activation becomes automatic, activation will come by a cue-context link in the environment, which is a system 1 activity. No deliberate, system 2, activity is needed. This decreases the risk that intentions get 'forgotten' in cognitive demanding situations. Secondly, behaviour regulated by motivation requires deliberate effort. If the behaviour becomes habitual and thus initiated automatic, the behaviour is shielded against the daily motivational fluctuation. If less cognitive resources are used to *make the decision to go*, more cognitive resources are saved to be fully engaged in the behaviour itself (Verplanken, Aarts, van Knippenberg, & Moonen, 1998; Verplanken & Orbell, 2003).

In recent years, the research of habit formation in the physical activity domain is rapidly increasing. The Self-Report Behavioural Automaticity Index (SRBAI) by Gardner and Verplanken offers a reliable measure for automaticity of behaviour. In the past, frequency of behaviour was often used to measure habit, but Gardner (2012) argues that it is not the frequency what distinguish habitual from non-habitual exercises. It is the a*utomaticity* of behaviour initiation, e.g. the ease of taking the decision to go. If this decision becomes (partly) under automatic control, less cognitive energy is needed to carry out the behaviour (Gardner, 2012; Ouellette & Wood, 1998; Verplanken & Orbell, 2003).

2.7 The role of automaticity of behaviour on the reflective and automatic action control
Habits are strong mental links, which become (partly) under unconscious control. The process of action control gradually becomes more under *automatic control* and less under reflective action control. The reflective processes, as part of the explicit system, are dependent on restricted working memory resources. Many daily activates are carried out with less reflective forethought, and initiated from automatic systems. Numerous studies have explained physical activity from a reflective viewpoint. Thus, the gap

between intentions and behaviour remains big, secondly physical activity intervention are characterized by high drop outs and low adherence. In recent years, research has shown that automatic processes might influence initiation and long-term maintenance of behaviour. However, no research is available which explains the effects of automaticity of behaviour within the adolescent population, although lifestyle habits are strongly influenced during this period in life.

Therefore this study explores the role of automaticity of behaviour within the constructs of the theory of planned behaviour and the self-determination theory, focused on a highly active adolescent population. Automaticity might influence the behaviour initiation, but it might also strengthen the reflective processes, which lead to physical activity behaviour. Therefore, this study examines the influence of automaticity both on *reflective processes* and on *actual behaviour.*

The integrated model of the SDT and TPB (Hagger, 2006) is used as a framework. Additionally, automaticity is added. Those factors together explain physical activity behaviour. The first aim of this study is to examine the role of automaticity on reflective processes, which are described in the integrated model of physical activity behaviour. Secondly, it addresses the effects of *automatic* processes on actual physical activity behaviour controlled for reflective processes.

No research to date has incorporated automaticity of behaviour in the integrated model for predicting physical activity. Neither any research was found which used the integrated model between self-determination theory and the theory of planned behaviour, to analyse the effects of automaticity of behaviour on both the SDT and TPB constructs.

The research addresses the influence of automaticity on the factors of the integrated model of SDT and TPB. Thus, the research firstly addresses the impact of automatic processes on reflective processes; behaviour regulation (hypothesis 1) and attitudes and intentions (hypothesis 2). Secondly, it addresses the effects of *automatic* processes on physical activity behaviour independently from reflective processes (hypothesis 3). In figure 6 the framework is schematically displayed:
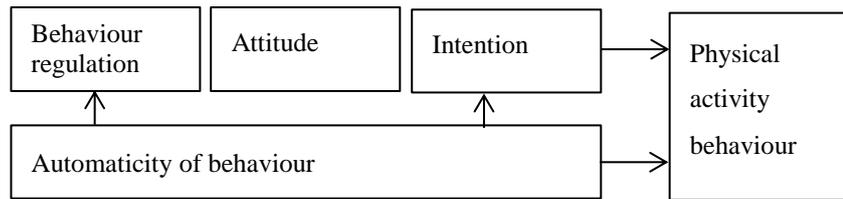
Figure 6: Research framework of the current study.

2.8 Purpose

The purpose of this study was to explore the role of automaticity of behaviour within the constructs of the theory of planned behaviour and the self-determination theory, focused on a highly active adolescent population. Firstly the relationship between automaticity of behaviour and behaviour regulation was calculated with correlation analysis. Secondly, a multiple regression analysis was used to measure the effects of automaticity of behaviour on intention. Finally, another multiple regression was used to measure the effects of automaticity on actual physical activity behaviour.

2.9 Research hypothesis

Three hypotheses will be tested in this research:

1. *Automaticity of behaviour is correlated with autonomous forms of behaviour regulation.* Automaticity of behaviour has been found to be positively correlated to intrinsic motivation, in a moderate active adult population (Gardner, 2012). This correlation has yet to be studied in an athletic adolescent sample.

2. *Automaticity of behaviour significantly explains exercise intentions.*

The second hypothesis states that automaticity of behaviour can significantly explain physical activity intentions. In this way, automaticity is thought to influence reflective processes which form the intention to do exercise.

3. *Automaticity of behaviour significantly explains exercise behaviour*

The third hypothesis states that automaticity has a significant influence on physical activity behaviour, if controlled for reflective processes like attitudes and intentions. This implies that if people have a strong automaticity in behaviour, intentions will become less powerful as an explanatory factor of physical activity behaviour.

3 METHODS

3.1 Research Design

This correlational and cross-sectional quantitative research explored the effects of automaticity on behaviour regulation, within high active adolescents. The effects of automaticity of behaviour and behaviour regulation on physical activity intention and behaviour were examined using correlation and multiple regression analysis.

3.2 Participants

Five hundred and eighty-four high school students (258 boys; 325 girls) from several sport high schools located in both urban and rural areas in Finland, completed a 4 paged questionnaire (see appendix *A). Aged ranged from 15 to 19 years (M=17.9, SD =.98). The population was highly active in sports; 84.4% of the sample is actively competing in sports. The average practise hours per week is 12.8 hours per week (SD=7.2 hours).

3.3 Procedures

This study is part of a broader research project at the university of Jyväskylä. The leader of the research project has gained the Ethical approval from the Ethical Commite of the Univeristyof Jyväskylä. A paper-pencil version of the questionnaire was completed in three sport high schools in Finland. According to the preferences of the school, the procedure was slightly different. In the common procedure the principle gave the permission to let students fill in the questionnaire. Consent forms were signed by the parents of students aged less than 18 years. Questionnaires were handed out by the researchers, whom also gave a brief instruction on how to fill in the questionnaire. In one case, instructions and questionnaires were distributed by post. Students filled in the questionnaire under supervision of their teachers.

Content of the general instructions about the questionnaire were as followed: there are no right or wrong answers, participation in the research is voluntary and withdrawing from the study in possible at any moment. Completing the questionnaire took approximately 35 minutes. Asking questions to the supervisor was allowed.

3.4 Measures

3.4.1 Self-reported Physical Activity Behaviour

Self-reported PA was assessed using one item from the Health Behaviour in School-aged Children Research Protocol. The item (I exercise at least 60 min) was rated on an 8-point Likert scale (0-7 days of the week). The Finish version of this item has been utilized in many earlier studies. (Aaro, Wold, Kannas, & Rimpelä, 1986; Aypar, 2012).

3.4.2 Attitudes

Participants were asked to rate three items related to PA (importance, usefulness and interest) based on the expectancy-value theory of achievement motivation (Eccles et al., 1983). The items were assessed on a 5 point Likert scale, ranging from 0=nothing at all to 5=very much. The three items were translated into finish.

3.4.3 Behavioural Regulation in Sport Questionnaire – 2

Behavioural Regulations in Sport Questionnaire (BRSQ2; Lonsdale, Hodge, & Rose 2008). The BRSQ is a 24-item measure, grounded in the Self-Determination Theory, that assess six forms of behavioural regulations: intrinsic motivation ("I participate in my sport because I enjoy it"), integrated regulation (e.g., I participate in my sport because it's a part of who I am"), identified regulation (e.g., I participate in my sport because I value the benefits of sport"), introjected regulation (e.g., "I participate in my sport because I would feel guilty if I quit"), external regulation (e.g., "I participate in my sport because if I didn't other people will not be pleased with me"), and amotivation (e.g., I participate in my sport but I question why I continue"). Each subscale consists of 4 items, and each item uses a 7-point Likert scale ranging 1 (not at all true), to very true 7 (very true) as a response. The scale was tested for internal consistency, test-retest reliability and factorial validity, thus the scale can be considered as a valid measure of the types of motivation for physical activity (Lonsdale et al., 2008). The factor analysis of the Finnish version of the BRSQ is under revision (Ruiz, Haapanen, Tolvanen & Robazza) Thus, Cronbachs' Alpha within this research support the high internal consistency scores within the subscales, for more details see *table 1 in the result chapter.

3.4.4 Self-Report Behavioural Automaticity Index

The Self-Report Behavioural Automaticity Index (SRBAI) is a four item automaticity subscale of the Self-Report Habit Index (Benjamin Gardner, 2011; Verplanken & Orbell, 2003). The automaticity subscale was found to be reliable to test the effects of habit on physical activity behaviour (Benjamin Gardner, Abraham, Lally, & de Bruijn, 2012).

The SRBAI was translated from Finnish to English, according to a three step back-forward translation process. First step was the translation from English into Finnish of the items by a panel of bilingual, native Finnish-speaking persons. The panel consisted of one expert on the topic, and two native persons not familar with the topic. They came up with a translation and discussed the content, and after a group discussion they came up with the final translation. Thirdly, the back translation from Finnish into English was done by a university teacher in Finnish as a second language. After that, the panel discussed the back transaltion and in agreement with the group minor changes were made. Finally, the translation of the scale was send to the author of the original scale, who agreed on the back translation of the scale. Test-retest analysis was performed to test the stability of the translated version . A sportteam of 16 athletes filled in the questionnaire two times, with a time interval of two weeks. Test-retest analysis showed that the correlation *(r=.54*)* between time 1 and 2 was significant, showing a moderate relation between the test and the retest measures.

3.5 Data analysis

Data were encoded and analysed using the Statistical Package for Social Sciences (IBM © SPSS Version 22.0). The data set was first examined for missing values using the missing value analysis. Preliminary examination of descriptive statistics, alpha coefficients, and correlations among all variables was conducted to check initial reliability and validity of the instruments. For reliability, Cronbach's alpha coefficient of each variable was calculated to determine internal consistency and reliability of the scale.

Bivariate Pearson correlation analysis was used to examine relationships between automaticity of behaviour and the six forms of behaviour regulation, on reflective constructs of the TPB (attitude and intention) and PA behaviour. According to Cohen (1988, pp. 79–81) the strength of the bivariate correlations of r values smaller than .10 are

considered small, r values between .10 and .49 are considered as moderate and r values of .50 to 1 are considered as large correlations.

Partial correlations analysis was used to examine the role of automaticity of behaviour on intention and behaviour, if controlled for motivation and controlled for constructs of the TPB, to ensure the unique role of automaticity of behaviour within the model.

Two multiple regression were performed, one to explain PA behaviour another explaining intention. Explanatory factors within the models are forms of self-determined behaviour, attitudes and automaticity of behaviour. Preliminary analyses were conducted to ensure no violation of the assumptions of normality, linearity, multicollinearity and homoscedasticity.

4 RESULTS

4.1 Reliability, Means & Standard Deviations

Descriptive statistics and Cronbach's alpha coefficients of all measures (behavioural regulations, attitude, intention and automaticity of PA behaviour and PA behaviour) are presented in table 1.

Reliability of all subscales of the instruments were at satisfactory level (> .70). Except two subscales (introjected regulation and intention) all other measured constructs showed a good internal reliability (> .80). Levels of > .70 were considerable, but levels of > .80 were preferable (DeVellis, 2003).

Mean scores on intrinsic motivation, integrated and identified behaviour regulation were considerable high. While the non-autonomous of behaviour regulation show rather low mean scores. Furthermore, kurtosis and skewness scores provide information about the form of distribution of the scores. Skewness scores express the direction and symmetry of the distribution. Looking at behaviour regulation, negative skewness scores were found for *intrinsic (-1.86), integrated (-0.83)* and *identified (-0.88)* behavioural regulation, which indicates a clustering of high scores. In addition, a high positive kurtosis scores was found for *intrinsic (3.86)* and a*motivation (3.86),* explaining a peaked distribution at the higher scores. The majority of the participants scored high on intrinsic motivation, thus this subscale was not normally distributed. Positive skewness scores were found for the non-autonomous forms of behaviour regulation; *external (1.95) and amotivation (1.86)* which express a majority of the distribution is located at extremely low scores. Also for *intention* (skewness -3.90. kurtosis *17.95)* and *attitude (skewness* -2.30 and kurtosis *6.50)* the scores were not normally distributed.

Table 1: *Cronbach's Alpha. Descriptive statistics (range, means, SD, skewness and kurtosis) of all used measures.*

	Cronbach's Alpha (n = 582)	Range	Mean	SD	Skewness	Kurtosis
SRBAI						
Automaticity of PA behaviour	.83	1-5	3.93	.80	-0.85	0.91
Intention	.69	1-5	4.80	.59	-3.90	17.95
Attitude	.76	1-7	4.7	.44	-2.30	6.50
Physical Activity Behaviour		1-7	5.77	1.38	-1.69	3.38
BRSQ						
Intrinsic	.90	1-7	6.23	.99	-1.86	3.86
Integrated	.84	1-7	5.31	1.23	-0.83	0.51
Identified	.82	1-7	5.44	1.13	-0.88	0.91
Introjected	.76	1-7	2.67	1.37	0.90	0.40
External	.89	1-7	1.73	.96	1.95	4.48
Amotivation	.90	1-7	1.72	.99	1.86	3.63

4.2 Correlations

Correlations between automaticity of PA behaviour, attitude, intention and the six forms of behaviour regulation were investigated, using Pearson product-moment correlation coefficient. The correlation scores are described in table 2.

Firstly, looking at the interaction between automaticity and constructs of self-determination theory, it can be concluded that a positive moderate correlation between automaticity and autonomous motivation (intrinsic, integrated and identified behaviour regulation) were found (see table 2; correlation table). While for the controlled forms of behaviour regulation (introjected and external) and amotivation, negative correlations where found.

Secondly, the effects on TPB constructs were accessed. Correlation coefficients show a strong relationship between attitude and behaviour (r=.531 p <0.01). A calculation of the coefficient of determination (r^2; see Pallant, 2011, p. 134) shows that attitudes share around 28 percent variance with exercise behaviour. Attitude is significantly correlated with intention, with a moderate correlation of r=.309, p<0.01.

The correlation coefficient between intention and behaviour is r=.454, p<0.01, which can be indicated as a moderate correlation. The correlation between automaticity of PA behaviour and attitude is moderate (r=.377. p <0.01) (Pallant, 2011).

Table 2**:** Correlations between automaticity of PA behaviour, exercise behaviour, intention, attitude and behaviour regulations.

		1	2	3	4	5	6	7	8	9	10
1.	Automaticity of behaviour	-	.42**	.30**	.38**	.41**	.46**	.33**	0.06	-0.02	-0.06
2.	PA behaviour		-	.45**	.53**	.44**	.51**	.39**	.15**	0.02	-0.02
3.	Intention			-	.31**	.34**	.30**	.29**	0.03	-0.05	-0.07
4.	Attitude				-	.50**	.46**	.42**	0.04	-.12**	-.08*
5.	Intrinsic					-	.61**	.53**	-0.06	-.33**	-.38**
6.	Integrated						-	.60**	.11**	-0.08	-.13**
7.	Identified							-	.19**	-0.02	-0.07
8.	Introjected								-	.60**	.50**
9.	External									-	.61**
10.	Amotivation										-

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

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

4.3 *Partial correlations*

Partial correlation analysis has been performed in order to examine how automaticity of PA behaviour is correlated with physical activity behaviour when controlling for the cognitive factors of attitude and intention.

Higher scores on the automaticity of PA behaviour measure requires less cognitive thought on making the decision to go exercising. Attitude and intentions are considered as cognitive conscious processes (De Bruijn, 2013).

Table 3: Partial correlations. A: the correlation between exercise behaviour and automaticity of PA behaviour, controlled for attitude and intention B: the correlation between exercise behaviour and intention, controlled for automaticity of PA behaviour. Pearson Scores (R scores) are presented in the table.

	Controlled variables	Variable	1.	2.
A.	Attitude & Intention	Exercise behaviour	-	.22**
		Automaticity of PA behaviour	.22**	-
B.	Automaticity of PA behaviour	Exercise behavioural	-	.38**
		Intention	.38**	-

** Correlation is significant at the 0.01 level (2-tailed)
*. Correlation is significant at the 0.05 level (2-tailed).

The first partial correlation was performed to explore the relationship between automaticity of PA behaviour and physical activity behaviour, while controlling for scores on cognitive measures of *intention and attitude (See correlation A in the table).* There was a moderate positive partial correlation between automaticity of PA behaviour and physical activity behaviour (r=.22) with higher levels of automaticity of PA behaviour leading to higher levels of physical activity behaviour.

A second partial correlation revealed a moderate positive correlation (r=.38) between intention and actual physical activity behaviour, while controlled for automaticity of PA behaviour.

4.4 Regressions analysis

Based on the integrated model of SDT and TPB (see figure 3), two multiple regression models were tested. The first model (see figure 7) tested the effects of behaviour regulation, attitude and automaticity on *intention.* In model 2, physical activity behaviour was predicted by behaviour regulation, attitude, intention and automaticity of behaviour. Results from the hierarchical regression analysis are presented in tables 4 and 5.
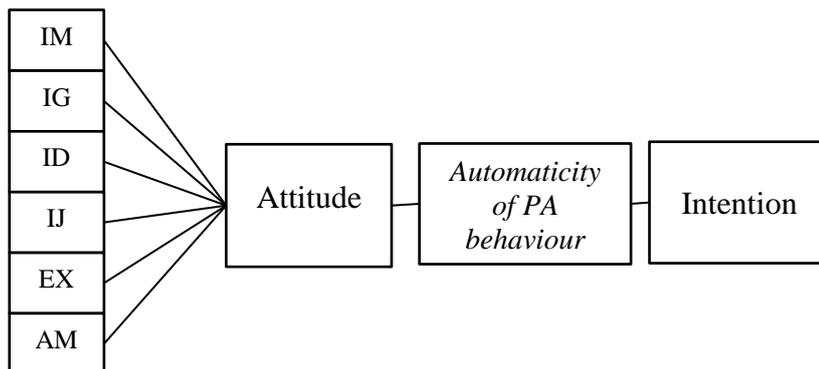

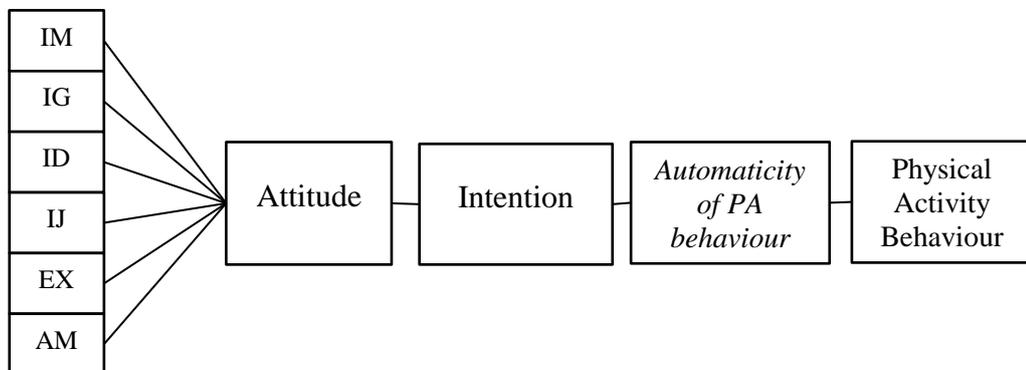**Figure 7:** Regression model intention.

Figure 8: Regression model physical activity behaviour.

Table 4: Multiple regression model on PA intention. *At the top row R^2, R^2 change, F and F change in R^2 from multiple regression analysis are presented, second row the Beta and Standardized regression coefficients with exercise intention as the dependent variable and behaviour regulation (step 1), attitude (step 2) and automaticity (step 3), as the independent variables (N=582).*

	Step 1:				Step 2:				Step 3:			
R^2	.14				.16				.17			
R^2 change	.14				.02				.02			
F	15.13 (p=.000)				15.15 (p=.000)				14.34 (p=.000)			
F change in R^2	15.13 (p=.000)				10.53 (p=.000)				10.19 (p=.000)			
df effect- df error	6-560				1-559				1-558			
Mean Standard Error (MSE)	4.55				4.35				4.18			
	B	SE B	β	sig	B	SE B	β	sig	B	SE B	β	sig
Step 1: (Constant)	3.28	.19		.00	2.65	.27		.00	2.60	.27		.00
Intrinsic	.15	.03	.26	.00	.12	.04	.21	.00	.11	.04	.18	.00
Integrated	.04	.03	.07	.18	.02	.03	.04	.42	.00	.03	.00	.95
Identified	.06	.03	.11	.03	.05	.03	.10	.07	.05	.03	.10	.06
Introjected	.00	.02	-.01	.92	.00	.02	-.01	.91	.00	.02	.00	.98
External	.02	.04	.03	.66	.02	.03	.03	.54	.01	.03	.02	.72
A motivation	.02	.03	.04	.50	.01	.03	.02	.74	.01	.03	.02	.76
Step 2: Attitude					.20	.06	.15	.00	.17	.06	.13	.01
Step 3: Automaticity									.11	.03	.14	.00

Table 5: Multiple regression model on PA behaviour. *At the top row R^2, R^2 change, F and F change in R^2 from multiple regression analysis are presented. Second row the Beta and Standardized regression coefficients with PA behaviour as the dependent variable and behaviour regulation (step 1), attitude (step 2) intention (step 3) and habit (step 4) as the independent variables (N=582).*

	Step 1:				Step 2:				Step 3:				Step 4:			
R^2	.312				.395				.456				.463			
R^2 change	.31				.08				.06				.01			
F	42.31 (p=.000)				52.09 (p=.000)				58.36 (p=.000)				53.22 (p=.000)			
F change in R^2	42.31 (p=.000)				76.47(p=.000)				62.22 (p=.000)				7.08 (p=.000)			
df effect- df error	6-559				1-558				1-557				1-556			
Mean Standard Error (MSE)	56.27				61.03				61.62				55.59			
	B	SE B	β	sig	B	SE B	β	sig	B	SE B	β	sig	B	SE B	β	sig
Step 1: (Constant)	.80	.40		.04	-2.56	.53		.00	-4.23	.55		.00	-4.23	.55		.00
Intrinsic	.34	.07	.24	.00	.17	.07	.12	.01	.09	.07	.07	.16	.07	.07	.05	.29
Integrated	.39	.06	.34	.00	.31	.05	.28	.00	.30	.05	.27	.00	.27	.05	.24	.00
Identified	.07	.06	.06	.22	.02	.05	.01	.77	-.02	.05	-.01	.76	-.01	.05	-.01	.80
Introjected	.04	.05	.04	.41	.04	.04	.04	.39	.04	.04	.04	.34	.04	.04	.04	.31
External	.11	.07	.08	.12	.14	.07	.10	.04	.13	.07	.09	.05	.12	.07	.08	.07
A motivation	.07	.07	.05	.27	.02	.06	.01	.79	.01	.06	.01	.87	.01	.06	.01	.88
Step 2: Attitude					1.08	.12	.35	.00	.96	.12	.31	.00	.91	.12	.29	.00
Step 3: Intention									.63	.08	.27	.00	.60	.08	.26	.00
Step 4: Automaticity													.17	.06	.10	.01

*p < .05. **p < .01.

4.4.1 Multiple regression 1: Explaining Physical Activity Intention

A multiple regression analysis performed in order to explore the explanatory power of the variables of behaviour regulation, intention and automaticity on intention to exercise (see figure 7 for the model, table 4 for the results).. The tolerance value for independent variables ranged between .426 and .752, which is all above the critical limit of .10; therefore the multicollinearity assumption was not violated (Pallant, 2011). This is also supported by the Variance Influence Factor values, ranging from 1.329 and 2.347, which is well below the cut-off point of 10. Additionally all correlation scores were checked, ranging from $r=.04$ to $r= 0.34$, which all stay well under the advised limit of $r=.7$, thus the assumption of bivariate correlations can be rejected (Pallant, 2011)

Step 1: Which forms of behaviour regulation predict intention?

At the first step the six forms of behaviour regulation (intrinsic, integrated, identified, introjected, external, a-motivation) were entered into the model. ANOVA showed that the explanatory factors in the model have a significant effect on the variance of intention ($F_{(6,560)} = 15.13$, *MSE* = 4.55, *p*=.00). The *R-square,* expressing the overall model fit, is $R^2 = .14$, in other words, the six forms of behaviour regulation explain 14% of the total variance in intention.

Standardized Beta scores (see *β values* in table 4) provided information about the impact of individual explanatory factors on intention. Taking a closer look at separate *β* scores of the different forms of behaviour regulation, we can observe that only the *intrinsic motivation (β=.26, p=.00)* is a significant predictor of intention. No significant beta values were found for the other forms of behaviour regulation, *integrated (β=.07, p=.18), identified (β=.11, p=.03), introjected (β=-0.01, p=.92). external (β=.03, p=.66)* and *a-motivation (β=.04, p=.50).*

Step 2: What is the role of attitude on intention, if controlled for behaviour regulation?

At step 2 attitude was entered into the model. The new model remained significant ($F_{(1,559)} = 15.15$, *MSE* = 4.35, *p*=.000). The overall model fit is $R^2 = .16$, in other words attitude explained an additional 2% (R^2 change= .02), of variance in PA behaviour. Attitude on itself has a significant influence on intention (*β=.15, p=.00*), if controlled for the effects of behaviour regulation.

Step 3: The impact of automaticity of behaviour on intention, controlled for behaviour regulation and attitude of PA behaviour

Automaticity of PA behaviour added in the last step of the model. The new model remained significant ($F_{(1,558)} = 14.34$, $MSE = 4.18$ $p=.000$). The overall model fit is $R^2 = .17$, in other words automaticity adds an additional 1% to the total variance of intention (R^2 *change* $= .01$). Standardized β score reveals that automaticity of PA behaviour ($\beta=.14$, $p=.00$) has a significant influence in explaining intention. In addition to automaticity, the other significant explanatory factors remained significant: *intrinsic motivation* ($\beta=.18$, $p=.00$) and *attitude* ($\beta=.13$, $p=.01$).

4.4.2 Multiple regression 2: Exploring Physical Activity behaviour

A multiple regression analysis was employed to explore influencing factors on PA behaviour (see figure 8 for the model, table 5 for the results). Multicollinearity statistics revealed that the tolerance score did not get lower as the critical value of .10 (Pallant, 2011). Tolerance scores ranging from .69 to .89, and therefore not suggesting Multicollinearity of the data. Additionally zero-order correlation scores were checked, zero-order scores within the regression model exceeding .7 are suggesting bivariate correlation, which is not the case in this analysis.

Step 1: Which forms of behaviour regulation predict physical activity behaviour?

At the first step the six forms of behaviour regulation (intrinsic, integrated, identified, introjected, external, a-motivation) were entered into the model. The explanatory factors are significant for explaining PA behaviour ($F_{(6,559)} = 42,31$, $MSE = 56.27$, $p=.000$). The *R-square value* ($R^2 = .312$) explains 31, 2% of the total variance in PA behaviour. Standardized Beta scores (see β *values* in table 5) provide information about the impact of individual explanatory factors on PA behaviour. A closer look at separate β scores of the different forms of behaviour regulation, indicates that only *intrinsic motivation ($\beta=.242$, $p=.000$)* and *integrated regulation ($\beta =.344$, $p=.000$)* are significant explanatory factors of PA behaviour. No significant results were found for the other forms of behaviour regulation, *identified ($\beta=.06$, $p=.22$), introjected ($\beta=.04$, $p=.41$). external ($\beta=.08$, $p=.12$)* and *amotivation ($\beta=.05$, $p=.27$).*

Step 2: What is the role of attitude, if controlled for behaviour regulation?

At step 2 attitude was entered into the model. The new model remains significant ($F_{(1,558)}$ = 52.09, *MSE* = 61.03, p=.000). The overall model fit is R^2 = .40, thus, explaining 40% of the total variance in PA behaviour. Attitude explained an additional 8% (R^2 change= .08), of variance in PA behaviour. Attitude after controlled for the effects of behaviour regulation has a significant influence on PA behaviour (β=.35, p=.00).

Noticeable is that the strength of intrinsic motivation as a predictor of physical activity behaviour decreased when automaticity of behaviour entered the model. The standardized Beta score of intrinsic *motivation* dropped from (step 1: β=.24, p=.00) to step 2: β=.12, p=.01), but are still significant.

Step 3: What is the impact of intention on PA behaviour, if controlled for behaviour regulation and attitude?

Intention was added in the third step of the model. The new model remains significant ($F_{(1,557)}$ = 58.36, *MSE* = 61.62 p=.000). The overall model fit is R^2 = .456, explaining 46% of the total variance in PA behaviour. The change in R^2 = .06, implied that intention adds an additional 6% to the total variance of PA behaviour. Inspection of the β scores reveals that intention (β=.27, p=.00) has a significant influence on the variance in PA behaviour. Other significant explanatory factors within the model are: *integrated motivation* (β=.27, p=.00) *external motivation* (β=.09, p=.05) and *attitude* (β=.31, p=.00). The effects of intrinsic motivation are no longer a significant explanatory factor of behaviour (β=.07, p=.16).

Step 4: What is the effect of automaticity of behaviour on physical activity behaviour, if controlled for the effects of motivation, automaticity of PA behaviour and attitude?

Automaticity was added in the last step of the model. The model remains significant ($F_{(1,556)}$ = 53.22, *MSE* = 55.59 p=.000). The overall model fit is R^2 = .463, explaining 46,3% of the total variance in PA behaviour. The change in R^2 =.01, implying that automaticity of PA behaviour adds an additional 1% to the total variance of PA behaviour. Inspection of the β scores reveals that automaticity of PA behaviour (β=.10, p=.01) has a significant influence on the variance in PA behaviour. Other significant predictors within the model are: *integrated motivation* (β=.24, p=.00), *attitude* (β=.29, p=.00) and *intention* (β=.26, p=.00). The effects of intrinsic motivation are no longer a

significant predictor of behaviour (β=.05, p=.29), whereas, *external motivation* (β=.08, *p=.07)* is close to the significance cut-off point.

5 DISCUSSION

The aim of the present study was to examine the role of automaticity in explaining intention towards physical activity and actual physical activity behaviour in a highly active adolescent sample, within the constructs of the self-determination theory and the theory of planned behaviour. It was hypothesized that a) high automaticity of behaviour would be related with intrinsic motivation and b) that high automaticity would be a stronger predictor towards actual behaviour. Correlation analysis showed that automaticity of behaviour is related to autonomous forms of behaviour regulations. Secondly, multiple regression analysis demonstrated that automaticity has a small but significant explanatory power on both intentions and actual physical activity behaviour.

The first hypothesis, that automaticity of behaviour is positively correlated with autonomous forms of behaviour regulation, was supported. Automaticity of behaviour was found to be positively correlated with autonomous behaviour regulation (i.e. intrinsic motivation, integrated regulation and identified regulation). This finding is consistent with previous studies exploring the relationship between automaticity of behaviour and behaviour regulation. For example in a study by Gardner (2012), it was reported that automaticity of behaviour was significantly correlated with intrinsic motivation and negatively related with amotivation and controlled forms of behaviour regulation. Furthermore, Gardner and Lally (2013) showed that self-determined regulation had a direct effect on automaticity, independent of past behaviour.

The second hypothesis stated that automaticity of behaviour could significantly contribute in explaining intentions for physical activity. The present results shows that automaticity of behaviour has a small but significant effect in explaining intention towards physical activity, even when reflective processes such as behaviour regulation and attitudes are controlled for. The idea that behaviour is shaped by a mix of reflective and automatic processes is supported by the dual-processes approach of Bargh (1999). Empirical research in the physical activity field has also supported this contention. For example, de Bruijn (2011) researched the intention-behaviour relationship over a two-week period and measured the effects of habit strength. Eighty-three percent of the

people, who successfully translated intention into behaviour two weeks later, scored high on automaticity measure. In contrast only two percent of the group of people who did not succeed in translating their intention into behaviour showed high scores on the automaticity measure. Within the strong habit group, 86 percent had strong intentions as well. These findings suggest that automaticity and intentions are related to each other. In more detail, past research (Glasman, 2006) suggests that the automatic processes has mainly influence on attitudes. Attitudes are strong predictors for intentions. Recent research suggests that automaticity affects in particular attitudes towards physical activity behaviour (Dimmock & Banting, 2009; Levesque 2008). Glasman (2006) offers a more general explanation on how automaticity and unconscious processes influence attitudes and motivation towards behaviour.

The third hypothesis, stating that automaticity of behaviour can add in the explanation of physical activity behaviour in a highly athletic adolescent sample, has also been supported. Inspection of the standardized beta-scores suggests that automaticity has a small but significant effect in explaining physical activity behaviour. This finding is in line with several past studies that suggest that physical activity has both an automatic and reflective component. (Aarts, Paulussen, & Schaalma, 1997; de Bruijn, 2011, 2013 Dijksterhuis & Aarts, 2000, 2010; Rhodes, de Bruijn, & Matheson, 2010). For example, De Bruijn (2011) found that automaticity of behaviour explained 7% additional variance after accounting for the constructs of the Theory of Planned Beahviour (De Bruijn, 2011). Habit formation has also been found to be a significant predictor for exercise behaviour in different age groups, for example in adults (Gardner, 2012), elderly (Fleig, Pomp, & Parschau, 2013) and children (Hashim & Jawis, 2013). These findings are replicated in the present study with automaticity of behaviour as a small but significant factor in explaining physical activity behaviour in highly active adolescents. However, findings of the current study are in contrast with the results of Dombrowski and Luszszynska's study (2009), who found that automaticity of behaviour, is not a significant predictor for physical activity behaviour in an adolescent sample. The difference in findings could be explained by the athletic background of the current study sample.

5.1 Additional findings

Looking at the regression model explaining intentions, it was found that intrinsic motivation was the strongest explanatory factor in the mode, while integrated motivation has no significant influence in explaining intention. This is in contrast with the regression model which explains actual physical activity behaviour. In this model intrinsic motivation was not a significant explanatory factor, but integrated behaviour was. This finding can imply that intrinsic motivation is important for planning future behaviour. On the other hand, actual physical activity behaviour is better explained by integrated motivation. This could imply that having a personal valued goal, which is achieved through the behaviour, is important in actually carrying out the behaviour. In addition, it was interesting to see that automaticity scores were higher related to integrated regulation and less related to intrinsic motivation.

In previous studies, relatively sparse research attention has been placed on the differences between intrinsic and integrated regulation, especially in the field of exercise and physical activity. While, by a more detailed inspection of earlier results, for example the regression model of Gardner (2012), the same trend was found. So far, most empirical research has nestled both integrated regulation and intrinsic motivation under the term *autonomous motivation*.

Burton (2006) explored the different outcomes of intrinsic and integrated regulation on well-being and academic performance in elementary and university students. He found that intrinsic motivation is related to higher well-being, (e.g. the students experienced direct positive emotion from studying) and integrated regulation to higher academic performance (e.g. the students experienced positive emotions when they received better objective study results, and related that outcome to studying). Burton posits that intrinsic regulation promotes a task orientation; the task itself will create satisfaction. On the other hand, integrated regulation promotes a process orientation; behaviour is regulated in order to attain an internalized long-term goal or value. Moreover, Austin & Vancouver (1996) state that integrated regulation will lead towards the development of commitment and persistence towards the internalized goal. Lydon, Burton & Menzies-Toman (2005) indicated that the extent to which individuals identify with their goals is predictive towards the commitment and progress, even in the face of adversity. Deci and Ryan (2002) state that reasoning of behaviour is "at the very basis of human

commitment and engagement". It could be argued that integrated regulation, which indicates that behaviour serves personal values in goals, will result in a stable reasoning of behaviour, and as Deci and Ryan suggest to commitment to behaviour. This commitment will increase stable action-initiation, and therefor relates to the development of automaticity.

The difference between integrated regulation as strong predictor for behaviour, and intrinsic motivation on intentions, can have implication for the intention-behaviour gap. If people have a valued goal they achieve trough the behaviour, this makes the behaviour less dependent on intentions.

It should be remembered that automaticity of behaviour is focussed on the action initiation, not on the performance itself (Verplanken & Melkevik, 2008; Verplanken, 2006). It considers how much reflective thought and planning (forming intentions) is needed to come to action initiation. New behaviours require high attention and deliberate planning. The decision to undertake a new action often comes after a time of deliberation, doubt and rational reasoning of the behaviour. This reflects the concept of intention in the Theory of Planned Behaviuor. A difference between novel and practised behaviour is the amount of reflective thinking it takes to come to the action-decision. Thus, the advantage of habit could be that the decision to go exercising becomes more stable and less deliberate, which results in less influence from external factors on the decision. This could be highly correlated with perceived behaviour control. For example; if a person runs every Monday morning, and the decision to go on Monday is made repeatedly over time, the decision thus needs less deliberate planning and rational reasoning, the person will not question as much *the decision to go or not*, reasoning will first become more stable, strengthening attitudes and gradually becomes under automatic control.

5.2 Limitations

More research on this topic is needed to fully understand the association between automaticity of behaviour and long-term adoption of physical activity. This research is limited by the use of a cross-sectional design. Not all the constructs of the theoretical frameworks were examined in the current research. Autonomy support, perceived behaviour control and social norms were not taken into account. The physical activity

measure accessed past behaviour, while in the models the measure is used as a measure for future behaviour. This is a major limitation in the research.

Secondly, it should be remembered that the distribution of the subscales intrinsic motivation was skewed at the higher end, and therefore there was no normal distribution. This is as expected, due to the characteristics of the sample, and similar to previous findings by Lonsdale et al. (2008). According to Tabachnick, skewness 'will not make a substantive difference in the analysis of reasonably large samples' *(Tabachnick & Fidell 2007. p. 80).* Taking in account the purpose of this research (exploring the role of habit in a highly active population) the skewed scores were expected and seen as a characteristic of the research population. Therefore this limitation was not harming the quality of the analysis.

Furthermore, numerous limitations must be considered in light of self-report measures, especially in examining automatic processes. By filling in a self-report about automaticity, the participants were required to engage in reflective process. The measure for automaticity of behaviour has been recently tested in several populations, and has shown to be reliable in several studies (de Bruijn, Gardner, van Osch, & Sniehotta, 2013; Gardner, de Bruijn, & Lally, 2011; Gardner, 2012; Gardner, Abraham, Lally, & de Bruijn, 2012; Gardner, 2011). Thus the measure also received some critique, i.e. Shienotta (2009), suggested that habit is behaviour activated by contextual cues. However, the context is not taken into account in the current questionnaire.

The measure used for actual behaviour, examines exercise behaviour of the past week. For future analysis, this measure should be used as a measure for past behaviour instead of actual behaviour.

The S.R.B.A.I. was translated into Finnish for the purpose of this research. The alpha coefficients show good internal consistency, but just 16 people completed a test-retest procedure with a two week interval, to ensure validity of the measure. General guidelines require more participants for this procedure (Behling, 2000). The low number of participants could have influenced the outcomes on the stability check of the measure. Nevertheless, the internal validity of the measure was efficient.

On the other hand, strength of the research lies in the large number of the participants. Due to the large number of participants, the statistical analysis has power to generalize to a bigger population, as long as the characteristics of the athletic sample are acknowledged.

5.3 Future research directions:

Goals can be conceptualized as mental representations of behaviours or behavioural outcomes that are desirable or rewarding to engage in or to attain (Dijksterhuis, 2010) He suggested that goal directed behaviour can come under automatic control, as the same action is repeated in the same context. If behaviour is perceived as rewarding, gradually the context can trigger the motivation to perform the behaviour. Future research can further explain the role between intrinsic motivation, emotions and automaticity, compared to the possible counterproductive effects of controlled motivation on automaticity. (Dijksterhuis and Aarts, 2010).

Further research could reveal if Burton's (2006) statement, about the difference in intrinsic and integrated motivation on goal orientation, is reflected in the sport setting. Avenues for future research in this regard could include the different outcomes (i.e. task or process orientation) of intrinsic motivation and integrated regulation. As such the influence of automaticity of behaviour on the behaviour regulation can be examined. In other words; is intrinsic motivation related to higher well-being, and integrated motivation to higher performance, which can be seen as higher repetition of behaviour? Secondly, it could be revealed if intrinsic motivation is better explained by a task orientation, and integrated motivation better by a process orientation. This finding could have implication to connect constructs of the goal achievement theory with the self-determination theory, and it's meaning on long term behaviour adoption. The current author supports the view of Wilson, calling for more research focussing on the role of integrated motivation in the sport and exercise setting. (Wilson & Rodgers, 2006).

Further research can investigate if integrated motivation, having a valued goal, is a condition to develop automaticity of behaviour. Automaticity is automatic goal directed behaviour. Thus, habit implies that the link between the goal and the action become so strong that it is the 'automatic response.' It could be interesting to see if this personal

valued goal (integrated regulation) leads to more stable engagement in the behaviour, and long-term adoption of behaviour. Secondly, recent research by de Bruijn (2013) has revealed that both perceived behavioural control, affect and planning predict automaticity. Secondly this research showed that as levels of perceived behaviour control increases, the explanatory power of planning decreases. Future research could reveal if integrated and intrinsic behaviour relate different to perceived behaviour control. And in addition how automaticity of behaviour affects this relationship.

An autonomy supportive environment was not examined in this research, despite the perceived link between autonomy and automaticity of behaviour. Deci and Ryan (2006, page 1558) state that autonomy should be interpreted as the "*free will to be engaged in an activity*", which consists of both reflective and automatic components. Autonomy should be seen as the free choice to engage in an activity, which is based on rational decision and not directed by emotions (Deci & Ryan, 2006). Another study from Chatzisarantis and Hagger (2007) showed that mindfulness has positive effects on the formation of automaticity. This findings suggest that emotional regulation, i.e. being able to understand and regulate feelings towards the decision of the behaviour, is extremely important in regulating behaviour. Further research could reveal how emotional reactions influence action initiation.

Yip (2013) reveals that emotional intelligence influences decision making processes. People with a better emotion-understanding were more successful in determining that their emotional state is not related with the current decision. Therefore, they were more successful in basing their decisions on their intention. This suggests that emotional intelligence can add to the successful decision making, and so to repeated action initiation. This is echoed in the research of Mohiyeddini (2009) who found that emotional appraisal of the intention towards physical activity mediates the intention-behaviour relationship. And that emotionally based intervention can add to frequency and duration of sport participation. Further research could reveal if the emotional reaction on the context influences decision making about action initiation, and how this affects the formation of automaticity. Motivation is a complex process that might fluctuate from day to day. Thus, if people have mixed feelings about underpin the behaviour they can still be intrinsically motivated but this state can easily change if the basic needs are not fulfilled. Thus, personal beliefs about the behaviour, which are in

line with the feelings and emotions the memory of the behaviour recreates, could be a strong predictor for the repeated initiation of behaviour. This may merit the inclusion of emotional regulation strategies in behaviour change interventions.

Long-term adoption and habit formation is hampered if negative feelings are consistently present. In the case of negative feelings, the behaviour is fully based on intentions. Carrying out behaviour on intentions, and suppressing negative feelings requires high levels of cognitive effort, such as engaging in self-control. This cognitive effort is hard to sustain over the long run and might lead to higher drop out. Thus, automaticity of behaviour can save these limited cognitive resources. Through repetition, the steps of actions that lead to action can become under automatic control. Thus, less cognitive resources are needed to take the decision to become active. Future research could examine the inhibitory effect of negative emotions on formation of automaticity and the conditional role of positive emotions on the formation of automaticity.

5.4 Practical implications

Results from the study explain that experiencing intrinsic motivation is important to plan future behaviour, on the other hand to actually carry out the plans, an underlying goal is important. In order to create commitment towards the behaviour, it is important that people can reason their behaviour with personally important gaols or values. This increases the commitment towards the behaviour.

One implication arising from this study is the possibility that automaticity can shield intentions from fluctuations in motivation. Thus, it can be argued that in an athletic sample automaticity of behaviour can be helpful. For athletes automaticity can safe guard intentions against moments of low motivation, for example after the loss of a competition.

The more decision-making becomes automatic, the less impact motivational fluctuation has on the decision. For participants who show high fluctuation in motivation from day to day, it can be beneficial to create a stable environment (a set time, place, and group of people), this can help to create a context-behaviour link.

Secondly, it is important that participants understand potential negative feelings towards the behaviour, and create coping mechanisms on how to understand and handle the conflict between positive intentions and negative associations or feelings. Mindfulness could be beneficial in this regard.

Long-term adoption and habit formation is hampered if negative feelings are consistently present. Thus, the ability of an individual to reason his physical activity behaviour is essential to build positive beliefs. If positive beliefs are reinforced, the belief is strengthened and thus rational reasoning in decision making becomes less important. The decision to get up and do sports needs less deliberate thinking and reasoning, and will be made rapidly. This saves cognitive resources, and is therefore less vulnerable to external influences.

Practitioners can aim to help people to become more aware of the reasoning of their behaviour. This can foster a discussion about the motives and beliefs the decision to become physically active is based on. Through such discussion participants can become more aware of their decision making process, motives and beliefs. If this discussion takes place in a group setting, individual can also develop a sense of relatedness.

This research suggests that automaticity, behaviour enacted by environmental cue's in the context, have an impact on the motivation and intention of physical activity behaviour. A change in context, for example changing schools or moving to a new house, can have influence on motivation and intentions. It can be that essential cues from the environment are missing, and that implicit motivation is not activated anymore. Changes in the daily routine can affect motivation and therefor attitudes and intentions towards physical activity. This can lead to a drop in motivation and intentions. With a change in routines and context, suddenly the behaviour is more dependent on rational reasoning and less on activation from cues in the context. This can be a moment that a people start questioning the behaviour more.

Practitioners can be extra aware of their clients which recently had a change of context. This can disturb their automatic action initiation. If so, they can be helped by rationally

planning the behaviour. The creation of implementation intentions and action planning can consciously place new links between the behaviour and cue's in the new environment.

5.5 Conclusion

The results of this study show that automaticity of behaviour can significantly account for the engagement or non-engagement in physical activity directly, to some extent. It can influence attitudes in two ways: firstly via reinforcement of personal beliefs and secondly via the positive association between context and the satisfying behaviour. The results also show that automaticity influences other reflective processes, such as the formation of intentions to do physical activity. Finally, automaticity of behaviour is correlated with autonomous forms of behaviour regulation, and it significantly explains intentions. These findings enhance our understanding of the role that automatic processes play in explaining physical activity behaviour in high active adolescents.

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APPENDIX

INFORMATION AND CONSENT FORM

Jyväskylän yliopisto
Liikuntakasvatuksen laitos

Liikuntamotivaatio TIEDOTE TUTKITTAVILLE

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Tutkimuksen taustatiedot
Säännöllinen ja monipuolinen liikunta on hyvin tärkeää ihmisen terveydelle ja kokonaisvaltaiselle hyvinvoinnille. Passiivisen elämäntavan terveyshaitat ovat tutkimuksissa ilmeisiä, mutta siltikään ihmiset maailmanlaajuisesti eivät liiku kansainvälisten liikuntasuositusten mukaisesti. Lisää tutkimusta siis tarvitaan selvittämään lukuisia liikuntatottumusten taustalla vaikuttavia motiiveja; mistä syistä ihmiset erilaisissa konteksteissa liikkuvat.

Tutkimus on osa isompaa tutkimusprojektia, joka tehdään Jyväskylän yliopiston liikuntakasvatuksen laitoksella. Tutkimuksesta valmistuu neljä (4) opinnäytetyötä. Tutkimus toteutetaan syksyn 2013 ja kevään 2014 aikana. Tutkimuksella ei ole rahoitusta.
Tutkimuksen tarkoitus, tavoite ja merkitys
Tämän tutkimuksen tarkoituksena on selvittää erilaisia nuorten liikuntatottumusten taustalla vaikuttavia syitä vertailemalla ryhmien (urheilijat, yläkoululaiset, tanssijat) välisiä motivaatioeroja sekä nuorten motiiveja eri kulttuureissa (Suomessa, Singaporessa).

On erityisen tärkeää tutkia nuorten liikuntamotivaatiota, jotta jatkossa voitaisiin suunnitella yhä aikaisempia ja sopivampia interventioita nuorten passivoitumisen ja sitä myötä aikuisuudessa ilmenevien elämäntapasairauksien ehkäisemiseksi.

Tutkimusaineiston käyttötarkoitus, käsittely ja säilyttäminen

Aineistoa käytetään vain tutkimuskäyttöön. Tutkittaville annetaan ID-koodi. Aineistoa käsitellään luottamuksellisesti sekä anonyymisti. Tutkimuksen aikana aineistoa säilytetään (liikuntakasvatuksen laitoksella) salasanalla suojatussa muodossa. Lisäksi kaikki tiedot ovat salassa pidettäviä ja tunnistetiedot poistetaan analysointivaiheessa. Tutkimuksen jälkeen tutkimusrekisteri arkistoidaan ilman tunnistetietoja (vähintään 5 vuotta).

Menettelyt, joiden kohteeksi tutkittavat joutuvat

2.1 Tutkimukseen osallistujat ohjeistetaan lyhyesti, jonka jälkeen he täyttävät kirjallisen suostumuslomakkeen. Suostumuslomakkeessa on kuvattuna tutkimuksen menettelyt, ja tutkittavat saavat myös tiedotelomakkeen. Molemmat lomakkeet löytyvät liitteenä. Allekirjoitettuaan suostumuslomakkeen, tutkittavia pyydetään täyttämään kyselylomakkeet. Aineisto kerätään tutkijan valvonnan alaisuudessa koulupäivän tai harjoituksen aikana, ja lomakkeiden täyttäminen kestää arviolta 20 minuuttia.

Tutkimukseen osallistuvat ovat nuoria urheilu-/balettikoulujen oppilaita sekä urheiluseurojen urheilijoita Suomesta (n. 400 hlöä). Singaporesta rekrytoidaan urheilukoulun oppilaita (n. 200 hlöä).

2.2 Tutkimuksen hyödyt ja haitat tutkittaville

Osallistumalla tutkimukseen tutkittava saa mahdollisuuden pohtia omaa liikunta- ja urheilumotivaatiotaan, ja näin kehittää itsetuntemustaan.

Tutkimukseen osallistumisesta ei aiheudu mitään tiedossa olevaa haittaa tutkittaville.

2.3 Miten ja mihin tutkimustuloksia aiotaan käyttää

Kerätty aineisto analysoidaan käyttäen SPSS-ohjelmaa, ja tuloksia tullaan käyttämään PALMS-kyselyn validoimiseen. Tuloksista tullaan julkaisemaan kansainvälisiä artikkeleita ja ne mahdollisesti esitetään kansainvälisissä kongresseissa. Opinnäytetyöt julkaistaan Jyväskylän yliopiston kirjaston ohjeiden mukaisesti. Tärkeimmät tutkimustulokset tullaan julkaisemaan suomenkielisissä lehdissä, kuten Liikunta ja Tiede, yleistajuisesti kirjoitettuna.

Tutkittavien oikeudet:

Osallistuminen tutkimukseen on täysin vapaaehtoista. Tutkittavilla on tutkimuksen aikana oikeus kieltäytyä tutkimuksesta ja keskeyttää tutkimukseen osallistuminen missä vaiheessa tahansa ilman, että siitä aiheutuu mitään seuraamuksia. Tutkimuksen järjestelyt ja tulosten raportointi ovat luottamuksellisia. Tutkimuksesta saatavat tutkittavien henkilökohtaiset tiedot tulevat ainoastaan tutkittavan ja tutkijaryhmän käyttöön ja tulokset julkaistaan tutkimusraporteissa siten, ettei yksittäistä tutkittavaa voi tunnistaa. Tutkittavilla on oikeus saada lisätietoa tutkimuksesta tutkijaryhmän jäseniltä missä vaiheessa tahansa.

Vakuutukset

Jyväskylän yliopiston henkilökunta ja toiminta on vakuutettu. Vakuutus sisältää potilasvakuutuksen, toiminnanvastuuvakuutuksen ja vapaaehtoisen tapaturmavakuutuksen.

Tutkimuksissa tutkittavat (koehenkilöt) on vakuutettu tutkimuksen ajan ulkoisen syyn aiheuttamien tapaturmien, vahinkojen ja vammojen varalta. Tapaturmavakuutus on voimassa mittauksissa ja niihin välittömästi liittyvillä matkoilla. Tutkittavalla olisi hyvä olla oma henkilökohtainen tapaturma/sairaus- ja henkivakuutus, koska tutkimusprojekteja varten vakuutusyhtiöt eivät myönnä täysin kattavaa vakuutusturvaa esim. sairauskohtauksien varalta. Tutkimuksesta on täytetty henkilötietolain edellyttämä rekisteriseloste, jonka tutkittava halutessaan saa tutkijoilta nähtäväkseen.

Liikuntamotivaatio

TUTKITTAVAN SUOSTUMUS TUTKIMUKSEEN OSALLISTUMISESTA

Olen perehtynyt tämän tutkimuksen tarkoitukseen ja sisältöön, kerättävän tutkimusaineiston käyttöön, tutkittaville aiheutuviin mahdollisiin haittoihin sekä tutkittavien oikeuksiin ja vakuutusturvaan. Suostun osallistumaan tutkimukseen annettujen ohjeiden mukaisesti. Voin halutessani peruuttaa tai keskeyttää osallistumiseni tai kieltäytyä tutkimukseen osallistumisesta missä vaiheessa tahansa.

Tutkimustuloksiani ja kerättyä aineistoa saa käyttää ja hyödyntää sellaisessa muodossa, jossa yksittäistä tutkittavaa ei voi tunnistaa.

Minuun voi ottaa yhteyttä myöhemmin tähän tutkimukseen liittyen (ympyröi)   KYLLÄ EI

SRBAI translation ENG-FIN

Self-Report Behavioural Automaticity Index

Original version SRBAI (Gardner, de Bruijn, & Lally, 2011; Verplanken & Orbell, 2003)	Translated version into Finnish *Three native Finnish speaker have translated the questions from English to Finnish. One week later two of them discussed the questions and came up with this final version.*	Back translation in English *I send the final translation to a native speaking Fin, studied English and currently working as a Finnish teacher for English speaking students. She was not part of the first group and has done the back translation.*
In general, for me, engaging in active sports and/or vigorous physical activities during my leisure time …	Yleisesti ottaen minulle liikuntaan tai rankkaan fyysiseen harjoitukseen osallistuminen vapaa-ajallani on asia jota...	Generally, taking part in physical exercise or hard physical training during my free time is a thing that...
is something I do automatically.	1. Teen automaattisesti	1. I do automatically
is something I do without thinking.	2. Teen ajattelematta sitä tietoisesti	2. I do it without conscious thinking
is something I do without having to consciously remember.	3. Teen tarvitsematta muistaa sitä tietoisesti	3. I do it without needing to remember it consciously
is something I start doing before I realise I'm doing it.	4. Teen huomaamatta mitä teen	4. I start to do without noticing what I do
on most days next week …	Useimpina päivinä ensi viikolla...	In most days during next week...
I intend to engage in active sports and/or vigorous physical activities for at least 30 min during my leisure time.	5. Tarkoituksenani on vapaa-ajallani osallistua liikuntaan tai raskaaseen fyysiseen harjoitukseen ainakin puolen tunnin ajan	5. On my free time, my intention is to participate physical exercise or hard physical training at least for half an hour.
I will try to engage in active sports and/or vigorous physical activities for at least 30 min during my leisure time	6. Yritän vapaa-ajallani osallistua liikuntaan tai raskaaseen fyysiseen harjoitukseen ainakin puolen tunnin ajan	6. On my free time, I try to participate physical exercise or hard physical training at least for half an hour.