Explicit (affective and cognitive) and implicit attitudes are differently associated with health behaviors. In order to integrate these attitudes in health-related decision-making models it is important to understand their relationships with values. The present study investigates the mediation role of explicit (affective and cognitive) and implicit attitudes on the link between values and behavior among adolescents with asthma and their healthy peers.

Results: Among adolescents with asthma cognitive and affective attitudes mediated relationships between the value of an exciting life / health value and risky / preventive behavior. Implicit attitudes were not related to values and mediated the relationship between affective attitudes and preventive behavior. Among healthy adolescents affective attitudes mediated the relationship between the value of an exciting life and preventive behavior. Thus, valuing health or an exciting life is associated with the attractiveness and usefulness of health behaviors for adolescents.

Keywords: values, asthma, risky behavior, preventive behavior, explicit attitudes, implicit attitudes, adolescents

Risky behaviors are one of the main reasons of mortality among adolescents [Viner et al., 2011], they require special attention from health care specialists. Adolescents suffering from chronic diseases engage in risky behavior more often than their healthy peers [Suris et al., 2008], which may affect their life quality at adult age / life expectancy [Reinikainen et al., 2014; Nimptsch et al., 2014].

Major theories explaining health behaviors (either risky or preventive) use cognitive
attitudes as one of the key elements. However, during the last decade, researchers discovered that affective attitudes have a considerable influence as well [Kiviniemi et al., 2007; Ostafin, Brooks, 2011]. Affective and cognitive attitudes may contradict each other. In this case the former predict risky behavior, while the latter tend to predict preventive behavior [Lawton et al., 2009]. Recent studies revealed a significant influence of implicit attitudes on health behaviors as well [Hollands et al., 2011]. Implicit attitudes do not necessarily correlate with explicit attitudes towards health behaviors and sometimes predict health behaviors even better than explicit ones [Ratliff, Howell, 2014; Prestwich et al., 2011].

Integration of both explicit (cognitive and affective) and implicit attitudes in the health-related decision-making models should be done considering their relationships with the other psychological concepts influencing health-related behaviors, such as values. Defining desirable goals, values are important descriptive factors for cognitive and affective attitudes [Bardi, Schwartz, 2003; Boer, Fischer, 2013]. Values may activate attitudes and explain the relationships between explicit attitudes, implicit attitudes and health-related behaviors.

The majority of studies investigating the influence of values on health behaviors are about health values. Each adolescent develops his/her own hierarchy of values, which essentially includes the value of health as well. However, Kristiansen found that the value of health is less cognitively available for younger adults than for older adults [Kristiansen, 1986]. To influence health behaviors a value should be activated. The presence of a chronic disease such as asthma may serve as an activation factor affecting the importance of the value of health among other values within the hierarchy. However, there are only a small number of studies investigating the role of values among people suffering from chronic diseases and asthma in particular [Fischer, Tarquinio, 2002].

Life values are important as well to understand health-related behaviors among adolescents suffering from asthma and their healthy peers. First, the same values may have different relationships with attitudes and behaviors, since values are determined by socio-cultural factors. For example, a preventive behavior is not necessarily associated with the value of health, but with life values (values of success and social recognition). At the same time, a risky behavior might not always be associated with low health value significance, but rather with the importance of the value of an exciting life.

Second, different values may be associated with the same type of behavior [Bardi, Schwartz, 2003]. For example, health-related behaviors (risky and preventive) were found to be associated with both the value of an exciting life and health values [Florenthal, Shoham, 2000; Kristiansen, 1986]. At the same time, Shwartz’s theory of values demonstrates that the abovementioned values are related to opposed systems of values, namely openness to change and conservation, which may lead to conflicts of values. The conflict of values might account for known contradictions between the cognitive and affective attitudes towards health behaviors.

The present study investigates relationships between the value of health, the value of an exciting life, explicit attitudes (cognitive and affective) and implicit attitudes (affective) towards health behaviors among adolescents with asthma and their healthy
peers. Since adolescents with asthma are at greater risk of developing depression symptoms, depression symptoms were included in the study in order to control them [DiMatteo et al., 2000; Feldman et al., 2005].

Hypothesis

(1) The value of health is more important for adolescents with asthma than for their healthy peers.

(2) The value of health is positively associated with preventive behavior and is inversely associated with risky one; the value of an exciting life is positively associated with risky behavior and inversely associated with preventive behavior.

(3) Explicit and implicit attitudes mediate the relationships between the values and health-related behaviors; attitudes related to the values have the biggest impact on preventive / risky behaviors.

Methods

Sample

Fifty adolescents 14–16 years old (M = 14,84; SD = 0,73; 28 males) diagnosed with bronchial asthma participated in the study. A control group of healthy adolescents of the same age (M = 14,64; SD = 0,68; 30 males) was included (n = 50). Power analysis indicated we had power of 0,8 to detect correlations of $r = 0,38$ for analysis of adolescents in one sample and power of 0,8 to detect differences between the two groups of adolescents (effect size = 0,5).

Procedure

The recruitment of adolescents was conducted between February 2014 and August 2014. All adolescents were recruited in Moscow, Russia. Adolescents and their parents gave their voluntary consent for participation. This study is part of a larger research project and was approved by both the French Committee of Ethical Evaluation (CEEI) and the Department of Psychology of Moscow State University. Recruitment of adolescents with asthma was organized in Moscow hospitals. The adolescents came with their parents for regular medical consultations and were invited to participate in the study. The recruitment of healthy adolescents was organized in a summer camp for children and adolescents.

Questionnaires

Values
The Rokeach Terminal Value Survey measured values [Rokeach, 1973]. Two values from the Rokeach Value Survey were included in the analysis: the value of an exciting life (fullness and emotional richness of life) and the value of health (physical and mental well-being). The Rokeach Value Survey is a rank method; a participant must list 19 values from most to least important (first rank place signifies the most important value within the hierarchy). The Rokeach Values Survey is a classic method of value measurement; it demonstrated good
psychometric qualities and validity [Rokeach, 1973; Braithwaite, 1985].

Explicit attitudes
The Health Attitudes Questionnaire measured explicit attitudes towards health behaviors [Ajzen, Fishbein, 1980]. Twelve types of risky and preventive behaviors were chosen from Matarazzo, Belloc and Berslow’s studies of the main types of behaviors influencing health [Matarazzo, 1984; Belloc, Berslow, 1972]. Each of these behaviors was evaluated on four bipolar scales from Osgood’s semantic differential (beneficial-harmful, useful-useless, pleasant-unpleasant, and interesting-boring). Means of the first two scales were taken as a measure of cognitive attitudes towards preventive / risky behaviors; means of the second two scales were taken as a measure of affective attitudes towards preventive / risky behaviors. The validity and psychometric qualities of the Health Attitude Questionnaire in the measurement of attitudes towards health behaviors were explored in several studies [Trafimov, Sheeran, 1998; Crites et al., 1994]. The questionnaire showed good internal reliability in the present study (Cronbach’s alpha for four scales ranged from 0,81 to 0,91).

Implicit attitudes
The Implicit Association Test (IAT) measured implicit attitudes towards health behaviors [Greenwald et al., 1998]. The participants were asked to classify words-stimulus among four categories (pleasant / unpleasant / preventive behavior / risky behavior) as fast as they could. The reaction time of association between different stimuli and categories was measured. IAT D-score was calculated for each participant [Greenwald et al., 2003]. Higher D-score indicates preference of preventive behavior over risky behavior. The IAT demonstrated good psychometric qualities and validity in the measurement of implicit attitudes [Palfai, Ostafin, 2003; Sherman et al., 2009; Wiers et al., 2002].

Preventive / risky behaviors
The Health Behaviors Questionnaire was used to study engagement in preventive and risky behaviors [Dayan, 1993]. Created and validated by Dayan [Dayan, 1993], the Health Behaviors Questionnaire includes 18 items (types of risky and preventive behaviors) which are evaluated on a six-point Likert scale (1 = engaging to 6 = not engaging). The Health Behaviors Questionnaire showed good internal reliability in the present study (Cronbach’s alpha for two scales ranged from 0,77 to 0,90).

Depression symptoms
The Beck Depression Inventory (short form, BDI-SF) measured depression symptoms. The BDI-SF includes 13 items. Each item is evaluated on a four-point scale. The BDI-SF demonstrated good psychometric qualities and validity [Furlanetto et al., 2005] and strong internal reliability in the present study (Cronbach’s alpha ranged from 0,77 to 0,83).

Results
Descriptive statistics
Table 1 illustrates means and standard deviations for 10 variables among healthy adolescents and adolescents with asthma.
Table 1
Means and standard deviations of 10 variables as a function of gender and health

<table>
<thead>
<tr>
<th></th>
<th>Suffering from asthma</th>
<th>Healthy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys (n=28)</td>
<td>Girls (n=22)</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>1. Health Value</td>
<td>7.25</td>
<td>5.70</td>
</tr>
<tr>
<td>2. Value of exciting life</td>
<td>6.17</td>
<td>5.07</td>
</tr>
<tr>
<td>3. Attitudes (preventive behavior)</td>
<td>4.19</td>
<td>0.94</td>
</tr>
<tr>
<td>4. Attitudes (risky behavior)</td>
<td>2.82</td>
<td>1.30</td>
</tr>
<tr>
<td>5. Cognitive attitudes (preventive behavior)</td>
<td>5.30</td>
<td>1.14</td>
</tr>
<tr>
<td>6. Cognitive attitudes (risky behavior)</td>
<td>1.79</td>
<td>0.71</td>
</tr>
<tr>
<td>7. Implicit attitudes</td>
<td>0.83</td>
<td>0.48</td>
</tr>
</tbody>
</table>
To test the first hypothesis, MANOVA (healthy vs suffering from asthma) was performed to study the differences in values between healthy adolescents and adolescents with asthma. MANOVA detected a significant effect of health on health value ($F(10, 89) = 4,05, p < 0,05, \eta^2 = 0,04$) and value of exciting life ($F(10, 89) = 4,34, p < 0,05, \eta^2 = 0,04$). This indicates that adolescents with asthma value health and exciting life more than their healthy peers.

To test the second hypothesis, first the correlation matrix was created for adolescents with asthma and their healthy peers (see Table 2).

Table 2
Correlations between 10 variables in two groups of adolescents (N = 100)
Among adolescents with asthma, the value of health was inversely related to risky behavior, \( r(48) = -0,46, p < 0,01 \), whereas the value of an exciting life was related to risky behavior, \( r(48) = 0,39, p < 0,01 \). Among healthy adolescents, the value of an exciting life was also correlated with risky behavior, \( r(48) = 0,31, p < 0,05 \). A Fischer's z test was conducted in order to compare the significance of within-group correlations between values and behavior among adolescents with asthma and their healthy peers. The inverse correlation between health value and risky behavior was greater among adolescents with asthma than among their healthy peers (\( z = 1,7, p < 0,05 \)).

Regression and mediation analysis

To test the third hypothesis, we first conducted a regression analysis including only attitudes-behaviors relationships (see Table 3). Cognitive attitudes towards risky behavior and implicit attitudes significantly predicted preventive behavior among adolescents with asthma. Affective attitudes towards risky behavior and cognitive attitudes towards risky behavior significantly predicted risky. Among healthy adolescents, affective attitudes towards preventive behavior significantly predicted preventive behavior. Affective attitudes towards risky behavior significantly predicted risky behavior.

Table 3
Regression analysis for attitudes related to risky / preventive behaviors among healthy adolescents and adolescents with asthma

<table>
<thead>
<tr>
<th></th>
<th>Preventive behavior</th>
<th>Risky behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( \beta )</td>
<td>( t )</td>
</tr>
<tr>
<td>Affective attitudes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(risky behavior)</td>
<td>0,28</td>
<td>1,65</td>
</tr>
<tr>
<td></td>
<td>(-0,09)</td>
<td>(-0,54)</td>
</tr>
<tr>
<td>Cognitive attitudes</td>
<td>-0,67</td>
<td>-4,15</td>
</tr>
</tbody>
</table>
We next included values in regression analyses. The variance explained in risky / preventive behaviors increased when values were included in the model (see Table 4).

Table 4

Variance explained in preventive / risky behaviors

<table>
<thead>
<tr>
<th></th>
<th>Adolescents with asthma (n = 50)</th>
<th>Healthy adolescents (n = 50)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Attitudes</td>
<td>Values-attitudes</td>
</tr>
<tr>
<td>Risky behavior</td>
<td>0,68</td>
<td>0,78</td>
</tr>
<tr>
<td>Preventive behavior</td>
<td>0,48</td>
<td>0,55</td>
</tr>
</tbody>
</table>

Using INDIRECT program [Preacher, Hayes, 2008] we studied the mediation effect of explicit / implicit attitudes on the relationships between the value of health, the value of an exciting life and preventive / risky behaviors.

Among healthy adolescents, affective attitudes towards preventive behavior mediated the relationship between the value of an exciting life and preventive behavior (see Figure 1). Bootstrapping revealed that the indirect effect was significant (indirect effect = –0,28; 95% CI [–0,68; –0,04]). This indicates that healthy adolescents who valued exciting life had more negative affective attitudes towards preventive behavior, which was associated with a lower preventive behavior score.
Figure 1. The mediation role of affective attitudes on the relationship between the value of an exciting life and preventive behavior among healthy adolescents. Note. n = 50, p* < 0.05, p** < 0.01.

Among adolescents with asthma, the relationships between the value of an exciting life and preventive / risky behaviors were mediated by cognitive attitudes towards risky behavior (see Figures 2–3). Bootstrapping revealed a significant indirect effect on preventive behavior (indirect effect = –0.16; 95% CI [–0.43; –0.03]). Bootstrapping also revealed a significant indirect effect on risky behavior (indirect effect = 0.10; 95% CI [0.01; 0.33]). This indicates that adolescents with asthma who valued an exciting life had more positive cognitive attitudes towards risky behavior, which was associated with a higher risky behavior score and a lower preventive behavior score.
Affective attitudes towards risky behavior also mediated relationships between the value of an exciting life and risky behavior (indirect effect = 0.31; 95% CI [0.06; 0.61], see Figure 4). This indicates that adolescents with asthma who valued an exciting life had more positive affective attitudes towards risky behavior, which was associated with a higher risky behavior score.
Figure 4. The mediation role of affective attitudes on relationship between the value of an exciting life and risky behavior among adolescents with asthma.

Among adolescents with asthma, the relationship between the health value and risky / preventive behaviors was mediated by cognitive attitudes towards risky behavior (see Figures 5–6). Bootstrapping revealed a significant indirect effect on preventive behavior (indirect effect = 0,17; 95% CI [0,03; 0,41]). Bootstrapping also revealed a significant indirect effect on risky behavior (indirect effect = –0,08; 95% CI [–0,30; –0,01]). This indicates that adolescents with asthma who valued health had more negative cognitive attitudes towards risky behavior, which was associated with a higher preventive behavior score and lower risky behavior score.
Figures 5–6. The mediation role of cognitive attitudes on relationships between health value and preventive / risky behaviors among adolescents with asthma.

Note. N = 50, p* < 0.05, p** < 0.01, p*** < 0.001.

Affective attitudes towards risky behavior also mediated relationships between the health value and risky behavior (indirect effect = –0.30; 95% CI [–0.60; –0.01], see Figure 7). This indicates that adolescents with asthma who valued health had more negative affective attitudes towards risky behavior, which was associated with a lower risky behavior score.
Implicit attitudes did not mediate the relationships between values and health behaviors. However, mediation analysis among adolescents with asthma showed that implicit attitudes mediated the relationships between affective attitudes towards preventive behavior and preventive behavior (indirect effect = 0.84; 95% CI [0.11; 2.45]). This indicates that adolescents who estimate preventive behavior as pleasant / interesting have a positive implicit attitude towards this behavior, which is associated with a higher preventive behavior score.

Discussion

As expected, both adolescents with asthma and their healthy peers who value an exciting life are likely to demonstrate a risky behavior and to demonstrate less preventive behavior. Among adolescents with asthma, however, an exciting life is not the only value associated with risky and preventive behavior. Those who value health as opposed to an exciting life are likely to demonstrate preventive behavior and demonstrate less risky one. As the relationships of health value and health behaviors may vary among healthy adolescents, these results only partially explain the second hypothesis. This fact can be explained since the value of health might be less cognitively available for healthy adolescents than for their peers with asthma. Adolescents with asthma value health more than healthy adolescents. These results are correlated with the studies of values among adults suffering from AIDS and cancer [Fisher, Tarquinio, 2002]. Possibly, chronic illness activates the value of health, which in turn influences health-oriented behaviors.

The relationships between the value of health, the value of an exciting life and preventive behavior are mediated by explicit (affective and cognitive) attitudes. Affective attitudes mediate the value-behavior link for healthy adolescents, while cognitive attitudes mediate
the value-behavior link among adolescents with asthma. Among healthy adolescents, valuing an exciting life consists in rating preventive behavior as unpleasant / uninteresting, which, in turn, implies lower engagement in preventive behavior. Among adolescents with asthma, valuing an exciting life means considering risky behavior as useful / beneficial, which also implies a lower engagement in preventive behavior. Overall, valuing health, as opposed to valuing an exciting life, consists in rating risky behaviors as useless / dangerous, which induces engagement in preventive behavior.

The value of health and the value of an exciting life are oppositely directed to both cognitive attitudes and preventive behavior among adolescents with asthma. However such a relationship was not confirmed for their healthy peers, as the value of health, in this case, has not been activated, as shown above. The experience of a chronic illness forces the value of health to become as important as the value of an exciting life, so the opposite relationship between these two values becomes clearer.

The above-described mediation effect of explicit attitudes is correct for the value of health, the value of an exciting life and risky behavior as well. Both affective and cognitive attitudes mediate a link between the health value, the value of an exciting life and behavior. Adolescents with asthma who value health consider risky behavior as both useful / beneficial and pleasant / interesting and thus are likely to engage less in risky behavior. Adolescents who value an exciting life consider risky behavior as both useful / beneficial and pleasant / interesting, and hence are likely to engage in risky behavior. Again, the value of health and the value of an exciting life are oppositely related to both cognitive attitudes and risky behavior.

Since explicit attitudes are mediators of the relationships between values and behaviors among adolescents in two groups, they are significantly associated with preventive / risky behaviors. This, in turn, supports the assumption that values activate cognitive and affective attitudes, which in turn influence health behaviors.

However, implicit attitudes mediate relationships between affective attitudes and preventive behavior, but they are not associated with values. One possible explanation is that implicit attitudes reflect implicit motivations and are less related to explicit values.

The cross-sectional design of the present study limits the conclusions about the predictable ability of values and attitudes in health behaviors. However, the results of the mediation analysis coupled with other research:

– Milfont et al. found that cognitive attitudes mediate the relationships between values and behaviors [Milfont et al., 2010];
– Kiviniemi found that affective attitudes influence physical activity behaviors [Kiviniemi et al., 2007].

One may conclude that values and related attitudes play an important role in health behaviors.

In a recent study, Conner et al. showed that changes in affective attitudes may proceed
without changes in cognitive attitudes [Conner et al., 2011]. This signifies that affective and cognitive attitudes are independent attitudes rather than two aspects of one attitude [Conner et al., 2011]. The present study shows that cognitive and affective attitudes are differently related to values. The value of an exciting life is related to bigger attractiveness and usefulness of risk behavior and lower attractiveness of preventive behavior. The value of health is related to lower usefulness and attractiveness of risky behavior. These findings stress how important it is to take into account the link between values and attitudes in programs for adolescents with asthma in order to prevent risky behavior and stimulate preventive behavior.

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