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Adherence to the Physical Distancing Measures during the COVID-19 Pandemic: A HAPA-Based Perspective

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Background: The COVID-19 pandemic requires massive and rapid behavior change. The Health Action Process Approach (HAPA) describes personal determinants that play a key role in behavior change. This study investigated whether these determinants are associated with adherence to physical distancing measures to prevent the spread of COVID-19 (i.e. keeping 1.5 m physical distance and staying at home). Decreased psychosocial well-being and lack of social support were explored as barriers to adherence. **Methods:** Two cross-sectional surveys were conducted among adults in Belgium. The first survey (N = 2,379; March 2020) focused on adherence to physical distancing measures. The second survey (N = 805; April 2020) focused on difficulty with, and perseverance in, adhering to these measures. Linear regression models were fitted to examine associations with HAPA determinants, psychosocial well-being, and social support. **Results:** Self-efficacy, outcome expectancies, intention, action planning, and coping planning were related to adhering to, difficulty with, and perseverance in, adhering to physical distancing measures. Decreased psychosocial well-being and lack of social support were related to more difficulties with adhering to physical distancing and lower perseverance. **Conclusions:** Health action process approach determinants are associated with adherence to physical distancing measures. Future work could design HAPA-based interventions to support people in adhering to these measures.

Keywords: COVID-19, HAPA, physical distancing, psychosocial well-being, social support

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PRACTITIONER POINTS

- Self-efficacy, outcome expectancies, intention, action planning, and coping planning are related to adherence to physical distancing measures.
- Reduced mental well-being is related to more difficulties to adhere to physical distancing measures and less perseverance in doing so.
- Social support is an important resource for adherence to the keeping 1.5 m physical distance measure.

INTRODUCTION

In the absence of a specific medicine or approved vaccination, governments are currently attempting to minimise the spread of the COVID-19 (European Centre for Disease Prevention & Control, 2020) by prescribing various behavioral measures (e.g. washing hands, staying at home, and keeping 1.5 m physical distance). These measures require collective and rapid behavior change, which can only be obtained by closely monitoring and understanding the key factors that prompt individuals to adopt or neglect these guidelines. Behavioral change theories have described two well-known challenges in this process. First, although people are often motivated to alter their behavior, this motivation does not always translate into actual behavioral change (i.e. the "intention–behavior gap") (Schwarzer et al., 2007). Second, once new behavior is acquired people often struggle to maintain this behavior over time, resulting in a high prevalence of relapse into old behavioral patterns (Kwasnicka et al., 2016). Given the unpredictable and often recurring nature of pandemics, governments require individuals to substantially alter their "usual" behavior for an extended period of time and to anticipate possible periods of recurrence. To achieve this behavioral change, there is a need for broad interventions to support people in altering and maintaining their behavior. These interventions are best informed by a theoretical framework that identifies which causal factors need to be targeted in order to reach behavioral change and maintenance (Michie & Abraham, 2004; Michie et al., 2017).

The Health Action Process Approach (HAPA) (Schwarzer & Luszczynska, 2008) is a theoretical framework that meets this requirement and addresses the two aforementioned challenges for behavioral change. The HAPA distinguishes between pre-intentional motivational processes contributing to a behavioral intention, and post-intentional volitional processes leading to the actual performance and maintenance of the behavior. In the motivational phase, positive outcome expectancies (e.g. "adhering to the guidelines will reduce the spread of the coronavirus") and self-efficacy (e.g. "I am capable of adhering to the guidelines") are the proximal determinants for developing an intention to change behavior. Additionally, risk perception (e.g. "I risk being contaminated with the

coronavirus") is considered a distal determinant. It might contribute to, but is not sufficient to develop an intention to change. In the volitional phase, the intention is translated into actual behavior via self-regulatory strategies. Indeed, a person aiming to adhere to the guidelines will need to translate this general intention into proximal and specific goals (i.e. action planning) and decide how (s)he will deal with potential barriers (i.e. coping planning).

Furthermore, the HAPA indicates that barriers and resources may influence the behavior change process. For example, social support has been put forward as an important resource to adopt or maintain health behaviors (Schwarzer et al., 2011). The measures taken to control the pandemic might deplete some of these resources and therefore hamper behavior maintenance. Also, studies on the psychological impact of COVID-19 have revealed that a substantial number of the population report increased anxiety and depression (Qiu et al., 2020; Wang et al., 2020). This may be caused by the uncertainty and the worries about getting infected with COVID-19 or about contaminating other people. Moreover, adherence to the physical distancing measures may entail a mental cost (Van Bavel et al., 2020). Decreased psychosocial well-being may, in turn, act as a barrier and impede further adherence to the measures.

The first aim of this study was to investigate the association between HAPA determinants (i.e. self-efficacy, outcome expectancies, risk perception, intention, action planning, and coping planning) and adherence to physical distancing measures (i.e. keeping 1.5 m physical distance and staying at home) established by the Belgian government during March–April 2020. A second aim was to explore resources and barriers for adhering to these measures. Specifically, we examined the role of social support and psychosocial well-being (i.e. self-reports of depression, anxiety, anger, and social isolation) in adherence to physical distancing measures. To this end, multiple cross-sectional surveys were conducted in the course of the COVID-19 pandemic outbreak and associated governmental regulations among Dutch-speaking adults in Belgium. This paper reports on the data of the first two surveys.

SURVEY 1

Methods

Participants. Participants for Survey 1 were recruited via an open call, which was distributed via social media platforms (i.e. Twitter, Facebook, and Instagram) and snowballing. Participants were included if they were 18 years or older and lived in Belgium at the time of the survey. Using this approach, 3,173 participants began to fill out the online survey, of which 2,427 participants completed it. Of the 2,427 entries recorded, 17 participants were identified as under 18 years, and four participants did not explicitly provide consent to take part.

Twenty-one participants were excluded because they did not live in Belgium at the time of the survey and were, therefore, not restricted by Belgian measures. Six more participants were excluded because they indicated that they did not answer the questions in the survey in an honest way. Removal of these cases resulted in a final sample of 2,379 participants.

Measurements. Demographic Information—General demographic information was assessed (i.e. age, sex, and educational attainment). Infection status was assessed by asking participants whether a physician had expressed serious concerns about a potential infection or actually diagnosed them with COVID-19 (yes/no). Additionally, participants were asked whether they still worked and, if so, whether they worked on-site or at home. If participants reported that they still worked, they were additionally asked if they needed to see other people in this context and if they could keep a 1.5 meter distance when doing so.

Physical Distancing: Keeping 1.5 m Physical Distance—Participants were asked to report the degree to which they intended to or actually kept a distance of 1.5 meters from other people, except from those with whom they lived. They were required to choose from the following five options: "No, and I do not intend to do this", "No, but I'm considering it", "No, but I have the intention to do this", "Yes, just recently", and "Yes, for some time".

Personal Determinants (HAPA)—Questions to assess HAPA determinants were adapted from an existing questionnaire measuring determinants for adopting an active way of living (Poppe et al., 2019a, 2019b). Poppe et al. (2019a, 2019b) selected items for the original questionnaire by presenting a large number of items assessing HAPA determinants to 11 researchers with expertise in self-regulation frameworks. Using the discriminant content validity method (Johnston et al., 2014), each of the experts rated for each item whether or not it measured the presented HAPA determinant and how confident they were of their answer. Cognitive interviews with four adults (mean age = 58.3, *SD* = 6.5, 3 women, two with a college/university degree) were performed with the best scoring items to ensure the comprehensibility of these items. For the current study, the items from this questionnaire were adapted to be relevant for the COVID-19 pandemic (i.e. adhering to physical distancing measures to prevent the further spread of COVID-19).

Self-efficacy was assessed by means of the following three items: "I have confidence in my ability to adhere to the measures on coronavirus", "I have confidence in my ability to adhere to the measures on coronavirus, even if it is sometimes difficult", "I have confidence in my ability to adhere to the measures on coronavirus, even if they hold for a long time". The three items showed good internal consistency ($\alpha = 0.84$; 95% CI [0.83, 0.84]). *Outcome expectancies* were assessed with the following three items: "If I adhere to the measures on

coronavirus, I have a lower risk of getting infected", "If I adhere to the measures on coronavirus, fewer people will get infected", and "If I adhere to the measures on coronavirus, other people will value me for this". The internal consistency of these items was low ($\alpha = 0.62$; 95% CI [0.59, 0.65]). Removing the last item ("If I adhere to the measures on coronavirus, other people will value me for this") increased the internal consistency ($\alpha = 0.78$; 95% CI [0.76, 0.80]). Therefore, only the first two items were taken into account to assess outcome expectancies. Two items were used to assess *risk perception*: "I have little chance of getting infected with the coronavirus" and "If I get infected with the coronavirus, I will recover quickly". The two items had poor internal consistency ($\alpha = 0.34$; 95% CI [0.29, 0.39]). Therefore, we decided to use only the first item ("I have little chance of getting infected with the coronavirus") in the final analyses. One item was used to assess *action-planning*, that is, "I know exactly what I'm going to do (e.g. how, when, where ...) to adhere to the measures on coronavirus". *Coping planning* was assessed by means of the following two items: "I have already thoroughly considered potential solutions in case I encounter obstacles when adhering to the measures (e.g. taking care of children, lack of social contact ...)" and "I have thought about specific solutions to obstacles that I may encounter when I'm trying to adhere to the measures on coronavirus". Finally, one item was used to assess *intention*: "I intend to adhere to the measures on coronavirus". Participants rated all items on a 5-point response scale ("1 = totally disagree", "2 = somewhat disagree", "3 = neutral", "4 = somewhat agree", and "5 = totally agree"). For all determinants assessed with more than one item (i.e. self-efficacy, outcome expectations, and risk perception) the mean score of the items was used in the analyses.

Psychosocial Well-being—The self-report short forms for anxiety, depression, anger, and social isolation, developed by the Patient-Reported Outcomes Measurement Information System (PROMIS®; www.healthmeasures.net), were used to assess psychosocial well-being. These scales have been found to be reliable and valid for use in the general population, and in populations with chronic health conditions (e.g. Cella et al., 2010).

We used the four-item PROMIS forms to measure anxiety, depression, and social isolation: the PROMIS® Item Bank v1.0 – Emotional Distress-Anxiety – Short Form 4a, for example, "I found it hard to focus on anything other than my anxiety" (Pilkonis et al., 2011); the PROMIS® Item Bank v1.0 – Emotional Distress-Depression – Short Form 4a, for example, "I felt worthless" (Pilkonis et al., 2011); the PROMIS Short Form v2.0 – Social Isolation 4a, for example, "I feel left out" (Hahn et al., 2010). Anger was measured by a five-item scale (PROMIS Item Bank v. 1.1 – Emotional Distress – Anger – Short Form 5a, for example, "I felt angry"; Pilkonis et al., 2011). All PROMIS items were answered about the past 7 days using a 5-point Likert scale ("1 = never", "2 = rarely", "3 = sometimes", "4 = often", "5 = always"). Raw scale scores were transformed into

standardised *T*-scores (M = 50, SD = 10). Higher scores indicate greater self-reported anxiety, depression, anger, and social isolation, respectively. The internal consistency as measured by Cronbach's alpha was .90 (95% CI [0.89, 0.91] for anxiety, .88 [95% CI [0.87, 0.89] for depression, .79 (95% CI [0.78, 0.80]) for social isolation, and .88 (95% CI [0.88, 0.89]) for anger.

Survey Procedure. Timing of the survey was attuned to the moment that the Belgian government issued new preventive measures to minimise the spread of COVID-19. In addition to the basic hygiene measures (i.e. washing hands, coughing or sneezing in the elbow) which were already in effect from the beginning of March, additional physical distancing measures (e.g. 1.5 meters distance) were adopted on 13 March (communicated on 12 March). These measures were in effect until 3 April. On 18 March (communicated on 17 March), the Belgian government issued six additional and stricter measures that would be in effect until 5 April, thus creating a situation in which civilians had to stay at home and avoid personal and work-related contact with others. To investigate people's behavior and psychosocial well-being during the times of these governmental measures, our online survey was made available from 20 March until 27 March.

Participants had access to the survey via an online link (programmed on the LimeSurvey 2.00 platform). The survey began with information about the study and with requiring participants to provide online informed consent. Participants filled out items in the following order: demographic information, adherence to physical distancing measures (here: keeping 1.5 m physical distance), personal determinants, and psychosocial well-being. At the end of the survey participants were asked if they deemed their data entry to be reliable, as an extra quality check. No rewards were given for completing this survey.

The study was approved by the Ethical Review Committee of the Faculty of Psychology at Ghent University (2020/38b). Because of the urgent and exceptional situation, a waiver was obtained for Survey 1 which positively evaluated that the study protocol was in line with the General Ethical Protocol of the Faculty (2020/38a).

Statistical Analyses. Analyses were performed using RStudio version 3.5.2 (R Core Team, 2019). Linear regression models were fitted to answer the two research aims. First, to investigate the relation between the HAPA determinants and adherence to the "Keeping 1.5 m physical distance" measure, three groups (i.e. not started adhering, just started adhering, already adhering for a long period of time) were created based upon their answers on the "Keeping 1.5 m physical distance" question. Six regression models were fitted. For each model, adherence to the "Keeping 1.5 m physical distance" measure was added as an independent variable. Self-efficacy, outcome expectancies, risk perception, intention, coping planning, and action planning were added as dependent variables in the different models. In each model we controlled for the impact of age, sex (i.e. men vs.

women), level of education (i.e. higher education vs. no higher education), infection status (i.e. no vs. yes), and whether respondents still needed to see other people at work (i.e. no vs. yes [with 1.5 meters distance] vs. yes [without 1.5 meters distance]).

Second, to investigate the association between adherence to "Keeping 1.5 m physical distance" and psychosocial well-being, a regression model was fitted for each indicator of psychosocial well-being (i.e. dependent variables: anxiety, depression, anger, and social isolation). Adherence to "Keeping 1.5 m physical distance" was added as an independent variable and the models were again controlled for age, sex, level of education, and whether respondents still needed to see other people at work. The statistical significance level was set at 5%, and 95% confidence intervals were reported as an indication of the effect size.

Results

Sample Characteristics. Participants' characteristics in Survey 1 are presented in Table 1. For the behavior "Keeping 1.5 m physical distance," 78 per cent (N = 1,866) participants indicated that they had been adhering to this measure for a long time, 20 per cent (N = 465) participants indicated that they just started with keeping 1.5 meters distance, and 2 per cent (N = 48) participants indicated that they were currently not adhering to this measure. A part of our sample showed elevated levels of anxiety, depression, anger, and social isolation compared to a reference population (Terwee & Luijten, 2018). Forty-four per cent (N = 1,036) of the sample scored more than 1 standard deviation higher than the population mean (i.e. more than 60) for anxiety. For depression, 18 per cent (N = 435) of the sample showed elevated scores and for anger this was 21 per cent (N = 489). Finally, only 7 per cent (N = 157) showed heightened levels for social isolation.

Personal Determinants. Higher scores on self-efficacy (β = 0.77; 95% CI [0.59, 0.94]), outcome expectancies (β = 0.37; 95% CI [0.18, 0.57]), intention (β = 0.55; 95% CI [0.41, 0.70]), action planning (β = 0.50; 95% CI [0.26, 0.75]), and coping planning (β = 0.30; 95% CI [0.0009, 0.60]) were found in people who reported to have just started adhering to "Keeping 1.5 m physical distance" in comparison with people who did not (yet) adhere to this measure. No difference between these groups was found for risk perception (β = −0.02; 95% CI [−0.32, 0.29]). Similarly, people who indicated that they were already adhering to this measure for a longer time had a higher score on self-efficacy (β = 1.04; 95% CI [0.87, 1.21]), outcome expectancies (β = 0.54; 95% CI [0.35, 0.74]), intention (β = 0.74; 95% CI [0.61, 0.88]), action planning (β = 0.84; 95% CI [0.60, 1.08]), and coping planning (β = 0.59; 95% CI [0.30, 0.87]) than people who did not (yet) adhere to these measures. Again, risk perception did not differ between the groups (β = −0.02; 95% CI [−0.32, 0.28]). In

TABLE 1
Sample Characteristics Survey 1

Characteristics	*Participants (*n = *2,379)*
Sex, *n* (%)	
Men	471 (20)
Women	1,903 (80)
Age, mean (*SD*), range	35.88 (12.75), 18–84
Level of education, *n* (%)	
Higher education or university	1,670 (70)
No higher education or university	709 (30)
Diagnosed with COVID-19	
No	2,293 (96)
Yes	86 (4)
Contact with other people at work, *n* (%)	
No	1923 (81)
Yes and I can keep 1.5 meters distance from other people	238 (10)
Yes and I cannot keep 1.5 meters distance from other people	218 (9)
HAPA determinants, mean (*SD*), range	
Self-efficacy	4.32 (0.62), 1.00–5.00
Outcome expectancies	4.31 (0.59), 1.00–5.00
Risk perception	3.17 (0.72), 1.00–5.00
Intention	4.74 (0.49), 1.00–5.00
Action planning	4.04 (0.82); 1.00–5.00
Coping planning	3.65 (0.98), 1.00–5.00
Psychosocial well-being in *T*-scores, mean (*SD*), range	
Anxiety	59.18 (7.86), 40.30–81.60
Depression	52.62 (8.23), 41.00–79.40
Anger	52.43 (9.40), 32.90–82.90
Social Isolation	47.63 (7.76), 34.80–74.20

contrast with people who had just started to adhere to the "Keeping 1.5 m physical distance" measure, people who were already adhering to this measure for a longer time scored higher on self-efficacy ($\beta = 0.28$; 95% CI [0.22, 0.34]), outcome expectancies ($\beta = 0.17$; 95% CI [0.10, 0.23]), intention ($\beta = 0.19$; 95% CI [0.15, 0.24]), action planning ($\beta = 0.33$; 95% CI [0.25, 0.42]), and coping planning ($\beta = 0.29$; 95% CI [0.19, 0.39]). Again, risk perception did not differ between the groups ($\beta = -0.01$; 95% CI [−0.11, 0.09]). An overview of all estimates and their associated 95% confidence intervals for the fitted models are presented in Table S1.

Barrier: Psychosocial Well-Being. No evidence for an association between any of the psychosocial well-being variables and adherence to the "Keeping 1.5 m physical distance" measure was detected. People who had just started adhering did report significant different levels of anxiety ($\beta = 0.68$; 95% CI

[−1.72; 3.07]), depression (β = −1.19; 95% CI [−3.72; 1.34], anger (β = −0.72; 95% CI [−3.61; 2.18]), or social isolation (β = −1.79; 95% CI [−4.17; 0.58]) in contrast to those that were not (yet) adhering to this measure. Similarly, no differences were found between those who adhered to this measure for a longer time in contrast to those who were not (yet) adhering. Table S2 provides an overview of all estimates and their associated 95% confidence intervals for models fitted to examine these associations.

Interim Discussion Survey 1

First, our results show that only a small group of respondents were not (yet) adhering to the "Keeping 1.5 m physical distance" measure. Second, except for risk perception, all HAPA determinants were higher in people adhering to the measure in comparison with people who were not. Temporary behavior change can often be established; behavior maintenance on the other hand is rarely achieved (Kwasnicka et al., 2016). Given the prolonged period of obliged physical distancing and potential tightening of this measure in order to prevent the further spread of COVID-19 in prospect, we may expect people to experience difficulty with adhering to the measures and differences between people in how long they are willing to persevere in adhering to the measures. Therefore, in Survey 2 (April 2020) we focused on examining the association between the experienced difficulty with and perseverance in adhering to the measures with HAPA determinants and psychosocial well-being.

SURVEY 2

Methods

Participants. As with Survey 1, participants were recruited online via social media (e.g. Twitter, Facebook) and via snowball sampling. The link to this survey was communicated along with some guidelines based on the results of Survey 1 (also via social media and via a blogpost). Only participants aged over 18 years and currently living in Belgium were included. As such, 1,097 participants began to fill out the online survey, of which 831 participants completed it. Of the 831 entries recorded, seven participants were identified as under 18 years and four participants did not give consent to take part. These participants did not progress past the information and consent page. Twelve participants did not live in Belgium at the time of the survey. A further three participants were excluded because they indicated that they did not answer the questions in an honest way. Removal of these cases resulted in a final sample of 805 participants.

Measurements. The items from Survey 2 were similar to those of Survey 1, with some notable differences. First, some items were rephrased or restructured to make the questionnaire more fluent, based upon the feedback provided by participants. Second, a set of new items was added to measure the difficulty in adhering to prolonged physical distancing measures (see below), and the social support participants experienced in adhering to these measures (see below). Third, and importantly, to match our survey to the change in regulations by the government, one item about "staying at home" was added. We considered this to be a second component of physical distancing.

Keeping 1.5 m Physical Distance and Staying at Home—In Survey 2 we not only focused on "Keeping 1.5 m physical distance" (as in Survey 1), but we also added "Staying at home" as a behavior. "Staying at home" was assessed by an item that questioned the degree to which participants intended to stay or actually stayed at home (except for going to work, buying groceries, going to the pharmacy or post office, doing sports, or helping other people in need). Response options were similar except for the option "yes, for some time" which was adjusted to "yes, since the beginning of the measures".

Difficulty with Adherence and Perseverance—Difficulty with adherence and perseverance were assessed via four items. Two items assessed the difficulty participants experienced to adhere to each of the physical distancing measures (i.e. "Keeping 1.5 m physical distance" and "staying at home") (response options: "not at all", "not really", "somewhat", "very much"). In addition, two items assessed participants' opinion about how long they would be able to adhere to these measures (i.e. their perseverance), specifying the range from "I can't cope anymore", "less than two weeks", "until the end of April", "until the end of May", "until the end of June", "until the end of July", "until the end of August", "as long as needed". For the analyses all items were dichotomised. For the "difficulty with adherence" items, a distinction was made between participants who reported no difficulty with adhering to the measures ("not at all" and "not really") and those reporting a lot of difficulty ("somewhat", "a lot"). For "perseverance" items, a distinction was made between participants who reported being able to adhere to the measures as long as needed versus those who reported not being able to adhere to the measures as long as needed, that is, until a specific date ("I can't cope anymore", "less than two weeks", "until the end of April", "until the end of May", "until the end of June", "until the end of July", "until the end of August").

Social Support—Participants were asked about their personal experience of social support by means of one item, that is, "Do you experience support from your environment in adhering to the measures (e.g. no negative reactions, accept that I adhere to the measures, adhere to the measures themselves, help me keep

up with the measures, supporting messages ...)?" This item was rated on a 4-point response scale ("1 = not at all", "2 = not really", "3 = somewhat", "4 = a lot").

Psychosocial Well-Being—The same PROMIS forms were used as in Survey 1 to measure anxiety, depression, social isolation, and anger. The internal consistency as measured by Cronbach's alpha was .90 (95% CI [0.89, 0.91] for anxiety, .89 [95% CI [0.88, 0.90] for depression, .80 (95% CI [0.78, 0.83]) for social isolation, and .91 (95% CI [0.90, 0.92]) for anger.

Survey Procedure. The survey was open from 10 April to 19 April. This time window encompassed a period in which several measures by the government were issued. Issued on 6 April, all previously communicated measures were to be prolonged until 19 April, and physical distancing measures remained intact except for some activities (e.g. essential transportation, physical activities in the open air, reopening of garden and hardware stores on 18 April). On 5 April it was communicated that all standing distancing measures were again prolonged until 3 May. The recruitment strategy was identical to Survey 1.

Survey 2 was also approved by the Ethical Review Committee of the Faculty of Psychology at Ghent University (2020/38b).

Statistical Analyses. Results were analysed using R version 3.6.1 (R Core Team, 2019). Linear regression models were fitted to the data.

First, to investigate the relation between the HAPA determinants (self-efficacy, outcome expectations, risk perception, intention, action planning, coping planning) and adherence to the measures ("Staying at home" and "Keeping 1.5 m physical distance"), 12 regression models (one for each personal determinant for both measures) were fitted. For each model, the difficulty with adhering to the measures (no difficulty vs. difficulty) and perseverance in adhering to the measures (as long as needed vs. not as long as needed) were added as independent variables. In addition, we controlled for the impact of age, sex (i.e. men vs. women), level of education (i.e. higher education vs. no higher education), and whether respondents still needed to see other people at work (i.e. no vs. yes [with 1.5 meters distance] vs. yes [without 1.5 meters distance]).

Second, the association between adherence to the measures and potential barriers/resources (i.e. psychosocial well-being and social support) was investigated by fitting a regression model for each indicator of psychosocial well-being (i.e. anxiety, depression, anger, and social isolation) and social support for each measure ("Staying at home" and "Keeping 1.5 m physical distance"). Again, difficulty with (no difficulty vs. difficulty) and perseverance in adhering to the measures (as long as needed vs. not as long as needed) were added as independent variables and the models were again controlled for age, sex, and level of education, infection status (i.e. no vs. yes), and whether respondents still needed

to see other people at work (i.e. no vs. yes [with 1.5 meters distance] vs. yes [without 1.5 meters distance]).

Again, the statistical significance level was set at 5%, and 95% confidence intervals are reported as an indication of the effect size.

Results

Sample Characteristics. Participants' characteristics in Survey 2 are presented in Table 2. For the behavior "Staying at home", 98 per cent of the participants reported that they adopted this behavior from the start of the measures (N = 789), 0.6 per cent adopted this behavior only recently (N = 5), and 1.4 per cent had not yet adopted this behavior (N = 11). For "Keeping 1.5 m physical distance" this was 98 per cent (N = 787), 1 per cent (N = 9), and 1 per cent (N = 9), respectively. However, 38 per cent (N = 302) and 34 per cent (N = 277) of the participants reported (a lot of) difficulty with adhering to "Staying at home" and "Keeping 1.5 m physical distance", respectively. Moreover, 39 per cent (N = 316) and 31 per cent (N = 251) did not indicate that they estimated being able to persevere in following the measures as long as needed for "Staying at home" and "Keeping 1.5 m physical distance", respectively. Furthermore, part of our sample showed elevated levels of anxiety, depression, anger, and social isolation compared to a reference population (Terwee & Luijten, 2018). Thirty-two per cent (N = 257) of the sample scored more than 1 standard deviation higher than the population mean (i.e. more than 60) for anxiety. Twenty and 22 per cent of the sample (N = 162 and 178) showed elevated scores for depression and anger, respectively. For social isolation this was only 8 percent (N = 67). Finally, 10 per cent of the sample (N = 79) reported that they did not receive social support.

Personal Determinants. For "Staying at home" the amount of difficulty with adherence was associated with the HAPA determinants self-efficacy ($\beta = -0.29$; 95% CI [−0.38, −0.20]), intention ($\beta = -0.23$; 95% CI [−0.31, −0.16]), and action planning ($\beta = -0.21$; 95% CI [−0.33, −0.08]): if people reported difficulties adhering to the measures, they scored lower on these HAPA determinants. The association with outcome expectations ($\beta = -0.09$; 95% CI [−0.19, 0.01]), risk perception ($\beta = -0.10$; 95% CI [−0.23, 0.02]), and coping planning ($\beta = -0.15$; 95% CI [−0.30, 0.002]) was not significant. Furthermore, participants who indicated that they could not persevere as long as needed scored lower on self-efficacy ($\beta = -0.46$; 95% CI [−0.56, −0.37]), intention ($\beta = -0.36$; 95% CI [−0.44, −0.28]), action planning ($\beta = -0.33$; 95% CI [−0.46, −0.21]), and coping planning ($\beta = -0.24$; 95% CI [−0.39, −0.09]). The association with outcome expectations ($\beta = -0.10$; 95% CI [−0.20, 0.01]) and risk perception was not significant ($\beta = -0.05$; 95% CI [−0.19, 0.08]).

For "Keeping 1.5 m physical distance" the amount of difficulty with adherence was associated with the HAPA determinants self-efficacy (β = −0.28; 95% CI [−0.37, −0.19]), outcome expectations (β = −0.13; 95% CI [−0.24, −0.03]), intention (β = −0.17; 95% CI [−0.25, −0.09]), and action planning (β = −0.25; 95% CI [−0.38, −0.12]): if people reported difficulties adhering to the measures, they scored lower on these HAPA determinants than if they did not report difficulties. The association with risk perception (β = −0.06; 95% CI [−0.19, 0.08]) and coping planning was not significant (β = −0.10; 95% CI [−0.26, 0.05]). Furthermore, participants who indicated that they could not persevere as long as needed scored lower on self-efficacy (β = −0.52; 95% CI [−0.61, −0.42]), outcome expectations (β = 0.13; 95% CI [−0.24, −0.03]), intention (β = −0.42; 95% CI [−0.50, −0.34]), action planning (β = −0.36; 95% CI [−0.49, −0.23]), and coping planning (β = −0.36; 95% CI [−0.52,

TABLE 2
Sample Characteristics Survey 2

Characteristics	*Participants* (n = *805)*
Sex, *n* (%)	
Men	235 (29)
Women	567 (71)
Age, mean (*SD*), range	38.39 (14.30), 18–82
Level of education, *n* (%)	
Higher education (high school or university)	584 (73)
No higher education or university	221 (27)
Diagnosed with COVID-19	
No	765 (95)
Yes	40 (5)
Contact with other people at work, *n* (%)	
No	651 (81)
Yes and I can keep 1.5 meters distance from other people	80 (10)
Yes and I cannot keep 1.5 meters distance from other people	74 (9)
HAPA determinants, mean (*SD*), range	
Self-efficacy	4.27 (0.66), 1–5
Outcome expectancies	4.25 (0.57), 2–5
Risk perception	3.00 (0.86), 1–5
Intention	4.62 (0.55), 2–5
Action planning	3.97 (0.85), 1–5
Coping planning	3.38 (1.00), 1–5
Psychosocial well-being in *T*-scores, mean (*SD*), range	
Anxiety	56.69 (8.11), 40.3–77.9
Depression	52.78 (8.39), 41.0–75.7
Anger	52.35 (9.69), 32.9–82.9
Social Isolation	48.30 (7.99), 34.8–74.2
Social support	3.20 (0.67), 1–4

−0.20]) than those who indicated that they could persevere as long as needed. The association with risk perception was not significant (β = −0.03; 95% CI [−0.17, 0.11]). An overview of all estimates and their associated 95% confidence intervals for the fitted models are presented in Table S3 (Staying at home) and 4 (Keeping 1.5 m physical distance).

Barriers: Psychosocial Well-Being and Social Support. For "Staying at home" results showed that participants who had difficulties adhering to the measures scored higher on anxiety (β = 1.54; 95% CI [0.38, 2.71]), depression (β = 2.01; 95% CI [0.81, 3.22]), anger (β = 2.29; 95% CI [0.91, 3.66]), and social isolation (β = 2.94; 95% CI [1.78, 4.09]) than participants who had no difficulties in adhering. There was no significant association with social support (β = −0.005; 95% CI [−0.11, 0.10]). Furthermore, participants who reported that they would not be able to persevere with the measures as long as needed scored higher on depression (β = 2.19; 95% CI [0.96, 3.42]), anger (β = 2.94; 95% CI [1.53, 4.35]), and social isolation (β = 2.19; 95% CI [1.00, 3.37]). The association with anxiety (β = 1.12; 95% CI [−0.07, 2.31]) and social support (β = −0.05; 95% CI [−0.15, 0.06]) was not significant.

For "Keeping 1.5 m physical distance" results showed that participants who had difficulties adhering to the measures scored higher on anxiety (β = 1.95; 95% CI [0.75, 3.15]), depression (β = 2.55; 95% CI [1.31, 3.78]), anger (β = 3.14; 95% CI [1.72, 4.57]), and social isolation (β = 2.50; 95% CI [1.30, 3.70]) than participants who had no difficulties in adhering. There was no significant association with social support (β = 0.02; 95% CI [−0.09, 0.13]). Furthermore, participants who reported that they would not be able to persevere with the measures as long as needed scored higher on anxiety (β = 1.85; 95% CI [0.62, 3.09]), depression (β = 2.99; 95% CI [1.72, 4.26]), anger (β = 2.74; 95% CI [1.28, 4.21]), and social isolation (β = 2.82; 95% CI [1.58, 4.05]) and lower on social support (β = −0.15; 95% CI [−0.26, −0.04]) than those who reported that they are able to persevere with the measures as long as needed. An overview of all estimates and their associated 95% confidence intervals for the fitted models are presented in Table S5 (Staying at home) and 6 (Keeping 1.5 m physical distance).

DISCUSSION

The aim of this study was twofold. First, we investigated the role of HAPA determinants (i.e. self-efficacy, outcome expectancies, risk perception, intention, action planning, and coping planning) in adhering to physical distancing measures (i.e. staying at home and keeping 1.5 m physical distance). Second, we explored potential barriers and resources (i.e. reduced psychosocial well-being and social support) that are associated with adherence to these measures.

Results regarding the HAPA determinants in the context of preventing the further spread of COVID-19 were in line with the hypotheses outlined by the HAPA (Schwarzer & Luszczynska, 2008). People who recently started to keep 1.5 m physical distance as well as people who had been adhering to the measure for a longer time showed more positive outcome expectations and higher levels of self-efficacy, intention, action planning, and coping planning compared to people who did not (yet) adhere to the physical distance measure. Moreover, our findings additionally showed differences between the two groups of people that were adhering to the measures: people that were adhering to the measures for a longer time showed more positive outcome expectations and higher levels of self-efficacy, intention, action planning, and coping planning compared to those people that had started following these measures only recently. Furthermore, people who reported more difficulties with adhering to the measures regarding keeping 1.5 m physical distance and staying at home showed lower levels of self-efficacy, positive outcome expectations, intention, and action planning than people who experienced no difficulties with adhering to these measures. Similarly, participants who did not consider themselves as being able to adhere to the measures on keeping 1.5 m physical distance and staying at home for as long as needed showed lower levels of self-efficacy, positive outcome expectations, intention, and action planning than people who intended to adhere to these measures as long as needed. In addition, coping planning was higher for people reporting adherence to the measures as long as needed compared to people who reported not being able to do so. Coping planning was not associated with the difficulty participants experienced with adhering to the measures. Coping planning involves prospectively linking coping strategies to anticipated barriers to behavior change and is thought to facilitate behavioral change maintenance (Sniehotta et al., 2005). Our findings support this idea. No effects were found for risk perception. This finding is in line with previous research indicating that the role of risk perception in altering health behaviors is limited (Zhang et al., 2019).

For psychosocial well-being, the results showed that for up to 40 per cent of the respondents anxiety was elevated, both at the beginning and after some weeks of living in a country affected by the COVID-19 pandemic and associated regulations. Up to 22 per cent of the sample had elevated scores on depression and anger. This is in line with findings about the psychological consequences of the COVID-19 pandemic in China (Wang et al., 2020) and a rapid review of previous studies on the psychological impact of physical distancing measures (or quarantine) (Brooks et al., 2020). Previous pandemics have learned that these mental health implications can extend beyond the epidemic itself (Brooks et al., 2020; Reardon, 2015; Shigemura et al., 2020). Here we investigated whether reduced mental well-being acted as a barrier for adherence to the physical distancing measures. At the beginning of the behavioral measures (i.e. in March 2020), no differences in psychosocial well-being (i.e. anxiety, depression, anger, and social isolation) were observed between those who adhered to the physical

distance measure and those who reported that they did not (yet) keep physical distance. Yet, later on (after following the measures for several weeks; i.e. in April 2020) we found that people with lower levels of psychosocial well-being experienced more difficulties with adhering to the physical distancing measures as communicated at that time (i.e. keeping 1.5 m physical distance and staying at home). People reporting higher levels of anxiety, depression, anger, and social isolation experienced more difficulties adhering to these measures and indicated that they were not able to adhere to the measures as long as needed.

In line with previous research (Gellert et al., 2011; Plotnikoff et al., 2007), social support was identified as a significant resource for the behavior change process. People who reported that they were able to adhere to the measure to keep physical distance as long as needed received more social support than people who indicated not being able to do so. These findings are in line with the suggestion of Van Bavel et al. (2020) to increase the impact of behavior change interventions by focusing on social networks and highlighting the positive behavior of others. Interestingly, keeping up with the measure to stay at home was not related to more or less support from friends and family. Tentatively, it could be that people consider the decision to (not) stay at home rather as something that they decide themselves, instead of something that is contingent upon the support or behavior of their social environment. Keeping 1.5 m physical distance, in contrast, might be more sensitive to the perceived support from other people because the success of this behavior is dependent upon mutual support and cooperation with other people.

Our findings support the relevance of the HAPA determinants in enhancing adherence to behavioral measures, for example, physical distancing measures, and reducing the difficulty with adhering to these measures in times of a pandemic. Previous HAPA-based interventions have been found to be effective for a wide range of health behaviors, including adopting an active lifestyle (Poppe et al., 2019a, 2019b) and facilitating sunscreen use (Craciun, Schüz, Lippke, & Schwarzer, 2012). Similarly, a HAPA-based intervention could be developed to support people in adhering to physical distancing measures. First, these tools may help people to increase their level of self-efficacy to adhere to the measures and their expectancies of positive outcomes if they adhere to the measures. Second, these tools might guide people in formulating specific action plans on when, where, and how they will adhere to physical distancing measures as well as formulating specific plans on how they will cope with potential barriers or obstacles in adhering to these measures. For instance, people might be guided in how to deal with the absence or low levels of support from peers or family in following physical distance rules (e.g. by explicitly asking them to keep a distance from you).

Furthermore, scientists and governments worldwide are preparing the population for the possibility of adopting some of these preventive behaviors for a longer time. As such, it is likely that (some) physical distancing measures will

have to become part of or integrated into our daily routines. Similar to other health behaviors (e.g. physical activity), interventions to promote habits with regard to COVID-19 measures may require the promotion of self-regulatory skills that enable repeated experience of the activity in conjunction with stable cues or contexts (e.g. each time you enter your house, you wash your hands) (Hagger, 2019). Future work could tap into this and elucidate factors or determinants that may help to form and maintain habitual behaviors. The HAPA is one of the most used theories to explain behavior maintenance (Kwasnicka et al., 2016).

This study has some limitations. First, our sample was not representative of the Belgian population. In general, respondents for both surveys were predominantly female, highly educated, and relatively young (i.e. the average age was 35 and 38 years for the first and second surveys, respectively; the youngest person was 18 and the oldest 84 years). Moreover, we only assessed educational level as a proxy for socioeconomic status although other indicators such as family income, wealth, and housing may also be important covariates that influence adherence to physical distancing measures. Second, our design was cross-sectional and therefore causal interpretations were not possible, nor was it possible to assess changes over time. Relatedly, the analytic technique chosen did not allow us to examine interrelationships between the HAPA determinants. Future work could include a longitudinal design and path analyses to overcome these limitations. Third, measures were rapidly changing at the time of the surveys. Both during Survey 1 and Survey 2, new measures were announced that could potentially have influenced the responses of the participants. Fourth, findings concerning social support should be interpreted with caution as the construct was assessed unidimensionally using a self-developed item. As such, only one aspect of social support, that is, emotional support, was addressed. Additionally, the example "no negative reactions" may have caused people to overestimate social support. Future work may use other (validated) scales covering more aspects of perceived support for health behaviors, such as the scale used by Povey et al. (2000) which asks participants to rate the perceived support from different groups (e.g. family, friends, health practitioners). A final limitation is that in Survey 2 we asked people to report on their perceived difficulty with and perseverance in adhering to these measures, which is a perception of their behavior rather than the behavior itself. Our findings should be interpreted in the light of this limitation.

Taken together, this study shows that the determinants outlined by the HAPA predict well (difficulties with) adherence to physical distancing measures. Reduced mental well-being and lack of social support were identified as barriers in the behavior change process.

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CONFLICT OF INTEREST

The authors have no conflict of interest to declare.

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SUPPORTING INFORMATION

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

Table S1. Estimates and their associated 95% confidence intervals for the regression models fitted to investigate the association between the HAPA determinants and adherence to the 'Keeping 1.5 m physical distance' measure, while controlling for age, sex, level of education, COVID-19 diagnosis and physical contact with others at work (Survey 1).

Table S2. Estimates and their associated 95% confidence intervals for the regression models fitted to investigate the association between adherence to the 'Keeping 1.5 m physical distance' measure and psychosocial well-being, while controlling for age, sex, level of education, COVID-19 diagnosis, and physical contact with others at work (Survey 1).

Table S3. Estimates and their associated 95% confidence intervals for the regression models fitted to investigate the association between HAPA determinants and the reported difficulty with and perseverance in adhering to the 'Staying at home' measure, while controlling for age, sex, level of education, COVID-19 diagnosis, and contact with other people at work (Survey 2).

Table S4. Estimates and their associated 95% confidence intervals for the regression models fitted to investigate the association between HAPA determinants and the reported difficulty with and perseverance in adhering to the 'Keeping 1.5 m physical distance' measure, while controlling for age, sex, level of education, COVID-19 diagnosis, and contact with other people at work (Survey 2).

Table S5. Estimates and their associated 95% confidence intervals for the regression models fitted to investigate the association between psychosocial well-being and the reported difficulty with and perseverance in adhering to the 'Staying at home' measure, while controlling for age, sex, level of education, COVID-19 diagnosis, and contact with other people at work (Survey 2).

Table S6. Estimates and their associated 95% confidence intervals for the regression models fitted to investigate the association between psychosocial well-being and the reported difficulty with and perseverance in adhering to the 'Keeping 1.5 m physical distance' measure, while controlling for age, sex, level of education, COVID-19 diagnosis, and contact with other people at work (Survey 2).