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## Original Article

# Changes in physical activity and basic psychological needs related to mental health among people with physical disability during the Covid-19 pandemic in Norway

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## ABSTRACT

**Background:** People with a physical disability are more inactive than the general population. Due to the positive effects of physical activity (PA) on physical and mental health, maintaining a physically active lifestyle is important especially during challenging periods of life.

**Objective:** Explore whether people with a physical disability experienced changes in PA, health status, and psychological need satisfaction (autonomy, competence and relatedness) during the first wave of the Covid-19 pandemic in Norway. Further, explore whether changes in psychological need satisfaction were associated with changes in PA level and mental health.

**Methods:** Cross-sectional retrospective study using an online self-reported questionnaire after the first wave during the Covid-19 pandemic.

**Results:** Of the 298 participants with physical disabilities ( $Age_M = 49yr$ ; 62% females; 66% using mobility aids), 66% reported decreased PA compared to the same period in the previous year, 45% reported declined health status due to increased pain and reduced physical functioning. Regarding psychological need satisfaction, it was primarily the change in need for autonomy and competence for PA that were associated with change in PA and mental health.

**Conclusions:** Most of the participants indicated decreased PA and about half decreased Health status during the Covid-19 pandemic. Further, the results indicated that it is important to nurture the basic psychological needs of autonomy and competence for PA when aiming to maintain or increase PA levels and mental health for this population living under restrictions of a pandemic.

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## Introduction

People with a physical disability lead a more inactive lifestyle compared to the general population, with less participation in sports, exercise and other forms of leisure time physical activity

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(PA).<sup>1–3</sup> This more inactive lifestyle is associated with decreased quality of life,<sup>4,5</sup> physical,<sup>6</sup> social and mental health,<sup>1</sup> and might be caused by the numerous barriers to become and stay physically active. Such barriers include availability of suitable mobility aids, accessibility to facilities, transport limitations, lack of motivation, as well as availability and competence of support personnel.<sup>1,7,8</sup>

During the Covid-19 pandemic, the restrictions put in place have increased the barriers for PA<sup>9</sup> and been associated with reduced PA and mental health both for the general population,<sup>10–15</sup> as well as for people with a neuromuscular disease or chronic health

condition.<sup>16,17</sup> For people with a physical disability, the Covid-19 related restrictions may both increase the pre-Covid-19 barriers and generate novel barriers through reduced access to health care professionals (e.g., physical therapists) and increased apprehension to engage in activities outside their home setting due to a relatively higher risk for developing serious Covid-19 related symptoms.<sup>18</sup> This higher risk may be related to the use of immunosuppressive drugs and/or secondary health conditions such as reduced lung function or cardio-vascular disease<sup>18</sup> and lower levels of fitness. The mentioned studies linking Covid-19 restrictions to reductions in PA levels for people with a disability were conducted in Italy and Spain, which were countries with at times relatively extensive restrictions.<sup>16,17</sup> However, other countries, like Norway have not experienced a total lock-down, allowing people to be physically active outside if they adhered to the rules of social distancing. While this has not yet been investigated, we expect that the extent of the Covid-19 related restrictions was extensive enough also in Norway to negatively impact on PA levels and mental health for people with physical disabilities.

Due to the positive effects of PA, maintaining motivation to adhere to PA is important especially in challenging situations or periods in life. Within the motivational theoretical framework of Self-determination theory (SDT),<sup>19</sup> it is argued that satisfaction of the three basic psychological needs of autonomy, competence and relatedness is crucial for maintaining a better quality of motivation and essential for people to experience thriving and overall well-being.<sup>20,21</sup> The need for autonomy describes individuals' perceptions of choice or self-endorsement in their involvement of activities and their behaviors as well as the importance of congruence between their own actions in relation to their interest and values, and not feeling pressured or controlled.<sup>19</sup> The need for competence explains how individuals perceive their competence and effectiveness when engaging in activities and serves as a subjective evaluation of mastery.<sup>22</sup> Finally, the need for relatedness refers to individuals feeling belongingness with other individuals. Here, a reciprocal feeling of relatedness is important, i.e., both feeling cared for and having the opportunity to care of others.<sup>19</sup> If individuals perceive their three basic psychological needs as fulfilled, this will lead to a better quality of motivation for behaviors that will more likely lead to increased engagement and persistence in the behavior over time.<sup>21,22</sup>

Psychological need satisfaction is influenced by social-contextual factors of the environment people live in and fluctuates both over time and in relation to different contexts.<sup>19,21</sup> In line with this, one study showed that the Covid-19 related restrictions in society and lifestyle habits negatively impacted on individuals' perceptions of basic psychological need satisfaction.<sup>14</sup> Further, in the general population, it has been indicated that satisfaction of the basic psychological needs during the Covid-19 pandemic is positively associated with positive mental health indicators (e.g., life-satisfaction,<sup>23</sup> well-being<sup>24</sup>) and negatively associated with indicators of mental distress (e.g., stress<sup>24,25</sup>). It is likely that the Covid-19 related restrictions negatively influence the satisfaction of individuals' three basic psychological needs in relation to PA by impacting on decision-making. More specifically, this concerns the type of activities that one can perform (autonomy), whether one feels capable and competent to perform the types of activities available (competence), and whether one feels restricted in participating in PA in groups or with other individuals (relatedness). While the above outlines the importance of psychological need satisfaction for maintaining PA and mental health during the Covid-19 pandemic, this has not yet been investigated in people with a physical disability.

The purpose of the present study was twofold. The first aim was to explore perceived changes in physical activity level, health status

and access to health services among people with physical disability during Covid-19 restrictions in Norway. The second aim was to explore whether changes in perceived need satisfaction (autonomy, competence and relatedness) were associated with changes in PA level and mental health status among people with a physical disability during Covid-19 restrictions in Norway.

## Method

### Design

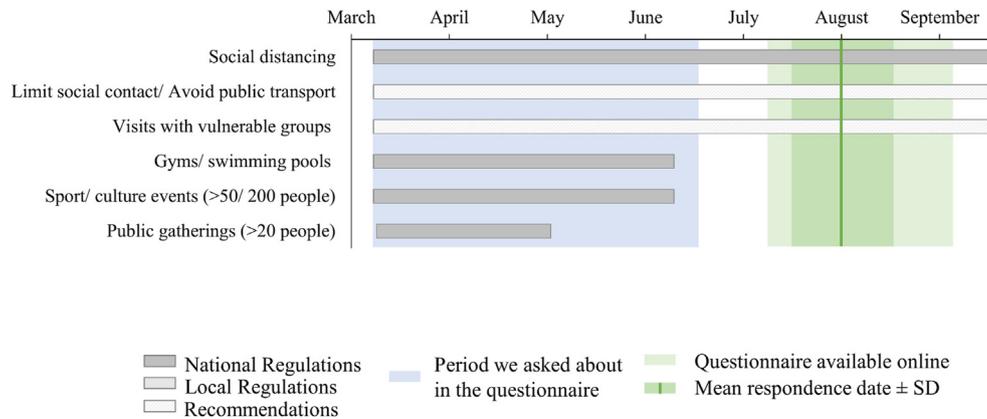
This cross-sectional survey was conducted following the period with the most extensive Covid-19 restrictions in Norway (March–June 2020) after having obtained pre-approval from the Regional Ethical Committee of Mid-Norway (ID 156692). Most of the questions asked the participants to look back and base the answers on their experiences during the period with the most extensive restrictions (Fig. 1).

### Participants and data collection procedure

Potential participants were approached with an invitation to participate in this study through social media accounts and through email correspondence via various interest organizations for people with disabilities in Norway. In the invitation, information about the study and the eligibility criteria to participate were presented. The study targeted participants  $\geq 16$  years of age, who had a physical disability. A physical disability was defined as long-lasting ( $>6$  months) reduced mobility or ability to perform one or several activities of daily life. For those who wanted to participate in the study, a link to an online questionnaire was provided. The online questionnaire was shared via a national questionnaire website and available from July 10th to September 9th 2020. The website allows for direct data export to and storage on the Norwegian platform Service for Sensitive Data provided by the University of Oslo. Participants could not be identified since we did not register their email or IP address.

### Measures

The questionnaire was based on self-reported measures and divided into three parts: 1) demographics and disability-related information, 2) physical activity, health status and healthcare services, and 3) basic psychological needs and mental health. Before the questionnaire was made available online, it was sent to expert members of the clinical-academic group "Physical activity and disability" at the Norwegian University of Science and Technology, as well as to several people with a physical disability within different interest organizations for people with disabilities as a step for content validation in the adaptation of items in the questionnaire for the current context.<sup>26</sup> The following demographical and disability-related data were collected: age, gender, region of residence, living in a city or rural area, type of disability and type of mobility aids, and whether tested positive for COVID-19. Most questions had closed answers with participants choosing one or more alternatives from a multiple-choice menu. The questions relating to type of disability and type of mobility aid were open-ended. JKB and BB retrospectively decided on the group divisions for the latter questions, then grouped the participants' answers independently, and resolved disagreements by consecutive discussions. Type of disability was divided into neurological impairments (i.e., cerebral palsy, acquired brain injury, multiple sclerosis, and spinal cord injury/spina bifida), musculoskeletal impairments (i.e., inflammatory and non-inflammatory rheumatic diseases, osteoarthritis, and amputation/dysmelia) and visual impairment.



**Fig. 1.** Covid-19 related restrictions and regulations in Norway, including the data collection period (light green) and the period we asked the participants about in the online questionnaire (light blue). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

Mobility aids were divided into wheelchair, walking frame, crutches/canes and prosthetics/orthotics. Inter-rater agreement between JKB and BB for determining the type of disability and mobility aid were 96% and 99%, respectively, and full agreement was reached after discussion of the deviating items between the two raters.

The second part of the questionnaire was related to changes in PA, changes in health status and health service availability. To assess the change in physical activity, participants indicated on a scale from 1 to 5 (1: “A lot less”, 2: “A bit less”, 3: “The same”, 4: “A bit more”, 5: “A lot more”) how much their PA levels had changed in the period of March to mid-June in 2020 compared to the same period in 2019. Further, we asked the participants to what extent they agreed/disagreed with five other PA related statements that mapped challenges and opportunities in being physically active on a scale from 1 to 5 (1: “Strongly agree”; 2: “Agree”; 3: “Neutral”; 4: “Disagree”; 5: “Strongly disagree”) (see [Appendix 1](#)). For both change in PA as well as the five other PA related statements, “I do not know” was added as a sixth option. In addition, we asked the participants to rate how many days per week they were physically active (i.e., engaged in activity that lasts 30 min or more, and results in increased breathing). Health status was assessed by asking participants whether they felt that their health improved, declined or remained stable, while a yes/no answer was available for the question assessing whether their accessibility to health service had changed. The closed questions about health status and health service were followed up by open-ended questions about how these potentially had changed. These responses were qualitatively sorted in main themes.

In the final part of the questionnaire, the validated version of The Basic Psychological Need Satisfaction and Frustration Scale (BPNSFS) using 12 items of satisfaction<sup>27</sup> was employed. The scale was modified to assess participants perceptions of change in need satisfaction in the context of PA due to the Covid-19 restrictions, rather than assessing current need satisfaction as done in the original version. This modified version in relation to change in need satisfaction due to Covid-19 has shown acceptable internal consistency in a previous study.<sup>24</sup> Each of the subscales for the three psychological needs consists of four items and is described in the following with one example item: Autonomy (e.g., I have felt a sense of choice and freedom in the things I have been undertaking related to my PA), competence (e.g., I have felt confident that I could do things well related to my PA), and relatedness (e.g., I experienced a warm feeling with the people I spent time with during PA). For

each item, the participants indicated how their perception had changed in the period of March to mid-June in 2020 in relation to them taking part in PA on a scale from 1 (decreased a lot) – 5 (increased a lot). Finally, mental health was measured using the 5 items well-being index from WHO,<sup>28</sup> an instrument that has previously been used and extensively validated (e.g. <sup>29, 30</sup>). The participants were asked to look back to the period of the stringent restrictions of Covid-19 from March to mid-June in 2020 and respond how they had generally felt on a scale from 1 to 6 (1 – “Never”; 2 – “Sometimes”; 3 – “Less than half of the time”; 4 – “More than half of the time”; 5 – “Most of the time”; 6 – “All the time”), with this as an example item: “I have felt cheerful and in good spirits”.

#### Data analyses

Microsoft Excel (Version 1908, Microsoft Corp., Redmond, WA, USA) was used to summarize the participants’ demographics and health related data, which are presented as absolute numbers (and percentages) unless specified otherwise.

Mplus (version 8.3)<sup>31</sup> was used for the analyses investigating the relationship between basic psychological needs, PA and mental health. To explore for the internal consistency of the latent variables (three basic psychological needs and mental health), confirmatory analyses (CFA) were conducted, using maximum likelihood estimation (MLR). Next, to explore for the relationship between each of the latent variables, as well as change in PA, correlation analyses were conducted with the Pearson’s correlation coefficient ( $r$ ), evaluating the strength of  $r$  using these cut-offs: trivial ( $r < 0.1$ ), small ( $0.1 < r < 0.3$ ), moderate ( $0.3 < r < 0.5$ ), large ( $0.5 < r < 0.7$ ), very large ( $0.7 < r < 0.9$ ) and nearly perfect ( $r \geq 0.9$ ).<sup>32</sup> Finally, structural equation modeling (SEM) with the same variables was conducted to explore whether; 1) changes in the three psychological needs (autonomy, competence and relatedness) and change in PA were associated with mental health, 2) changes in the three psychological needs were associated with change in PA. Exact significance values ( $p$ ) are reported for the analyses exploring associations, and evaluated as significant if  $p < 0.05$ . Further, due to a relatively low sample size, a trend towards significance was considered present if  $p < 0.07$ .<sup>33</sup> Note that the variable “change in PA” was converted to a continuous variable for the correlation and SEM analyses. Exploration of model fit for both CFA and the SEM modeling was evaluated using a combination of the following fit indices<sup>34</sup>; Comparative Fit Index (CFI)  $\geq 0.90$ , Tucker–Lewis index

(TLI)  $\geq 0.90$ , Standardized Root Mean Square residual (SRMR)  $\leq 0.08$ , and Root Mean Square Error of Approximation (RMSEA)  $\leq 0.06$ .

## Results

### Demographics and disability-related information

A total of 298 participants completed the questionnaire. An overview of the demographics and disability-related information is presented in Table 1. The mean age of the participants was  $49 \pm 16$  years, 62% were female and 66% were relying on mobility aids for ambulating in daily life. Only one participant had tested positive for the coronavirus.

### Change in physical activity and perceived health

With regard to the change in PA, 21% and 45% of the participants indicated that they were “a bit less” and “a lot less” active, respectively, in the period of March to mid-June 2020 compared to the same time of the year in 2019 (Fig. 2). Participants were engaging in at least 30 min of physical activity on  $2.8 \pm 2.2$  days week<sup>-1</sup> in the period from March to mid-June 2020. Furthermore, 45% indicated that their Health status had declined in the period under investigation, with increased pain and decreased functioning being the main reasons. In addition, 59% indicated that

**Table 1**  
Participants' demographics, disability-related characteristics, change in health status and health services.

Age (years)	
Mean $\pm$ SD [Range]	49 $\pm$ 16 [16–86]
Sex	
Female	186 (62%)
Male	109 (37%)
Not specified	3 (1%)
Urban vs rural	
City (>5000 inhabitants)	221 (74%)
Countryside (<5000 inhabitants)	77 (26%)
Type of disabilities	
Neurological impairments	
Cerebral palsy	33 (11%)
Acquired brain injury	38 (13%)
Multiple sclerosis	13 (4%)
Spinal cord impairment*	71 (24%)
Musculoskeletal impairments	
Inflammatory rheumatic diseases	56 (19%)
Non-inflammatory rheumatic diseases	7 (2%)
Osteoarthritis	10 (3%)
Amputation/dysmelia	21 (7%)
Visual impairment	6 (2%)
Not specified	43 (14%)
Mobility aids	
None	105 (35%)
Wheelchair	111 (37%)
Crutches/canes	61 (20%)
Walking frame	7 (2%)
Prosthetics or orthotics	14 (5%)
Tested positive for COVID-19	
Yes	1 (0.3%)
No	296 (99%)
Do not want to disclose	1 (0.3%)
Change in perceived health status	
Health improved	23 (8%)
Health declined	134 (45%)
Health remained stable	141 (47%)
Change in healthcare offer	
Yes	175 (59%)
No	123 (41%)

Note. The numbers are presented as absolute values (and percentage values) unless specified otherwise.

their health service offers had changed, with reduced access to physical therapy and rehabilitation facilities being listed as the most frequent change.

### Relations between change in basic psychological needs, change in PA and mental health

The CFA analyses indicated acceptable fit for the latent variables (Table 2). In Table 3, mean and standard deviation are presented for changes in the three basic psychological needs, change in PA and mental health, along with the results of the correlation matrix showing significant and positive relations between these variables. Of importance, there were moderate positive associations between mental health and respectively change in autonomy ( $r = 0.41$ ,  $p < .001$ ) and competence ( $r = 0.48$ ,  $p < .001$ ), whereas the positive association with change in relatedness ( $r = 0.22$ ,  $p = 0.006$ ) and PA ( $r = 0.33$ ,  $p < .001$ ) were small and moderate, respectively. Further, change in PA was moderately associated with change in autonomy ( $r = 0.42$ ,  $p < .001$ ) and largely associated with change in competence ( $r = 0.52$ ,  $p < .001$ ), whereas the association with change in relatedness was small ( $r = 0.18$ ,  $p = 0.005$ ).

The results of the SEM analyses (Fig. 3) indicated acceptable fit to the data:  $\chi^2 (123) = 185.02$ ,  $p = 0.000$ , CFI = 0.97, TLI = 0.97, RMSEA = 0.04 (90% CI = 0.03–0.05), SRMR = 0.05. Thirty-three % of the variance was explained by the model for mental health and 28% was explained for change in PA. In Fig. 3, the significant results are illustrated: Change in competence was positively associated with both changes in PA ( $\beta = 0.74$ ,  $p < .001$ ) and mental health ( $\beta = 0.43$ ,  $p = 0.031$ ). Further, there was a trend towards a positive association of change in PA with mental health ( $\beta = 0.12$ ,  $p = 0.066$ ). Change in autonomy was not significantly associated with change in PA, nor mental health, even if the results from the correlation indicated moderate associations.

## Discussion

As expected, we found a decrease in self-reported PA and perceived health status in people with a physical disability living in Norway during the first wave of the Covid-19 pandemic. Further, it was primarily the change in needs for autonomy and competence in the context of PA that were positively associated with change in PA and mental health.

### Change in PA and perceived health

About two thirds of our participants indicated that their PA levels were lower during the period with the most severe Covid-19 restrictions (i.e., March to mid-June 2020), while they still reported to perform at least 30 min of moderate to vigorous PA on an average of ~3 days a week. The reductions in PA during Covid-19 restrictions are in line with findings from similar studies conducted on people with chronic conditions and<sup>17</sup> and in the general population.<sup>12,13</sup> Interestingly, the PA levels of on average 90 min a week in the current study were similar to what has been reported in people with chronic conditions living in Spain<sup>17</sup>, where restrictions were more severe than in Norway. Given the possibility to engage in PA outdoors, we would have expected PA levels to be higher in the current study sample. That this is not the case may be explained by the substantial proportion of our participants using a wheelchair during daily life, for whom ambulation outside may be more challenging, especially given that there were still considerable amounts of snow in March in large parts of Norway. In addition, the decreased PA levels in the current sample may be related to being afraid to leave the house to engage in PA (indicated by half of our participants), a reduction in PA opportunities which existed before

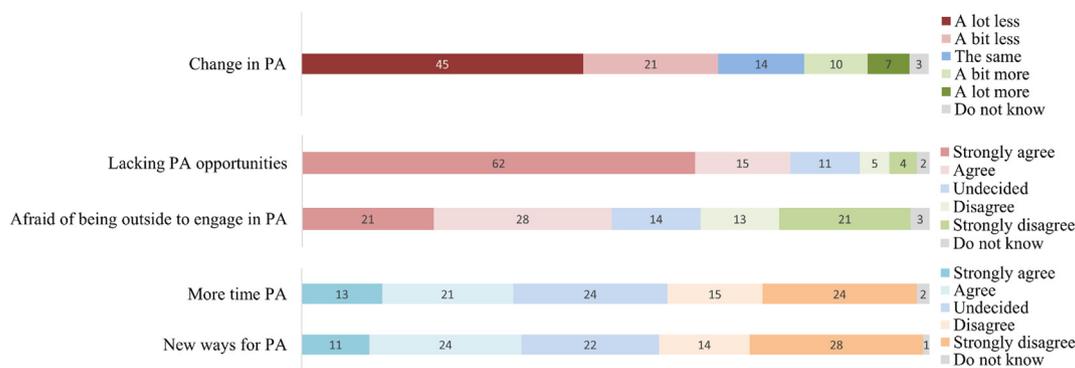


Fig. 2. Percentages of respondents that answered the questions related to physical activity (PA) within each of the respective five-item scales. \* Note that the exact formulations for each question are attached in Appendix 1.

the Covid-19 pandemic (indicated by three quarters of our participants) and reduced access to healthcare services (indicated by two thirds of our participants).

Overall, the current findings indicate that PA levels during the period with Covid-19 restrictions in people with a disability were well below the 150 min week<sup>-1</sup>, which are recommended by WHO for maintaining health.<sup>35</sup> The lower PA levels may lead to detrimental effects on the already lower physical and mental health in people with a physical disability. Alarming and in line with this, about half of our participants reported a decrease in perceived health status with increased pain and reduced functioning in daily life, which may at least in part be attributed to the decrease in PA. To our knowledge, the reasons for the decreased PA and effects on perceived health have not yet been systematically documented in people with a physical disability during the Covid-19 pandemic. The present study may therefore provide a good point of departure for designing interventions to increase PA in this population in case the Covid-19 restrictions continue, or if similar situations arise in the future.

*The role of changes in psychological needs related to change in PA and mental health*

While there may be related studies that are now rapidly published, this is to the best of our knowledge the first one to investigate the satisfaction of the basic three basic psychological needs in the context of PA, in people with physical disabilities during the Covid-19 pandemic. In line with the few early studies conducted on the general population during this pandemic,<sup>24,25</sup> changes in the need for autonomy and competence showed the strongest associations with both change in PA and mental health. Also during ordinary (non-pandemic) circumstances, the satisfaction of the need for autonomy has previously been found to be a strong predictor of intention to exercise,<sup>20,36</sup> and crucial for experiencing higher levels of functioning, self-regulation and well-being.<sup>37,38</sup> Further, the

SEM-analysis, focusing on the relationship between variables in a more integrated manner, indicated that it was change in competence that was the only significant contributor of the three needs that was related to change in PA and mental health. While this has not yet been specifically investigated during the Covid-19 pandemic, previous studies show that it is especially the satisfaction of the need for competence that is positively associated with both PA adherence and frequency.<sup>39,40</sup> On the other hand, our finding of the positive relationship between the satisfaction of the need for competence and mental health was also shown in several other studies conducted during the Covid-19 pandemic,<sup>23–25</sup> as well as during non-pandemic circumstances.<sup>21</sup> It has been suggested that feeling competent during the Covid-19 pandemic particularly influences peoples’ sense of being in control, which in turn was related to coping with stress.<sup>25</sup> Subsequently, there is a need to support and nurture the need for competence also in the context of PA for people with a physical disability during a pandemic.

Interestingly, the change in the need for relatedness played a less crucial role for the change in PA and mental health during the pandemic. It has been discussed whether people with disabilities are better at coping with the social distancing and isolation during the Covid-19 pandemic.<sup>41</sup> This might be the case because many had lived a more restricted social life already during pre-pandemic situations.<sup>41</sup> Thereby, their change in the need for relatedness in the context of PA might be of less significance in comparison with changes in two other needs during the Covid-19 restrictions in relation to change in PA mental health.

The practical implications of the current study are that it is of utmost importance to nurture the needs for autonomy and competence in the context of PA. Increasing awareness of existing suitable PA offers and establishing new and tailored PA offers may empower people with a physical disability through increased autonomy. As such, they can choose which PA to engage in while living their everyday “pandemic-life”, despite the restrictions.

Table 2 Result of confirmatory factor analysis of the latent variables.

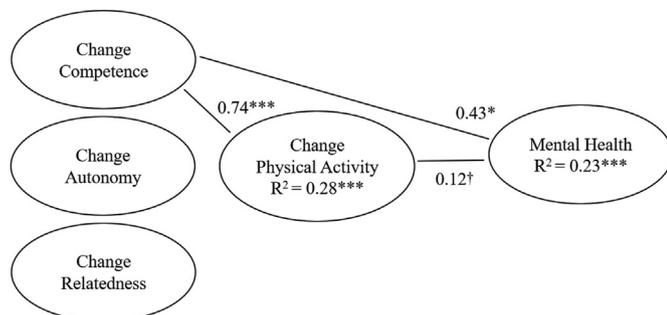
Variable	$\chi^2$ (df)	CFI	TLI	RMSEA (90%CI)	SRMR
Change autonomy	5.68 <sup>2</sup>	0.98	0.95	0.08 (0.00–0.16)	0.03
Change competence	0.02 <sup>1</sup>	1.00	1.00	0.00 (0.00–0.08)	0.001
Change relatedness	0.24 <sup>1</sup>	1.00	1.03	0.00 (0.00–0.12)	0.006
Mental health	2.43 <sup>4</sup>	1.00	1.01	0.00 (0.00–0.07)	0.01

Note. \* <0.05;  $\chi^2$  = Chi Square; df = degrees of freedom; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation and 90% Confidence Interval; SRMR = Standardized Root Mean Square Residual.

Table 3 Estimated correlation matrix for the variables.

Variable	M	SD	1	2	3	4
1. Change autonomy	2.57	0.79	–			
2. Change competence	2.57	0.86	0.89***	–		
3. Change relatedness	2.96	0.68	0.48***	0.52***	–	
4. Change physical activity	2.09	1.28	0.42***	0.52***	0.18*	–
5. Mental health	3.68	1.14	0.41***	0.48***	0.22*	0.33***

Note. † <0.07, \*p < 0.05; \*\*\*p < 0.01; \*\*\*\*p < 0.001; In cross-sectional studies the means of latent variables are zero, SPSS was thereby used to calculate the means and standard deviations.



**Fig. 3.** SEM-model of the associations between change in basic psychological needs, change in physical activity and mental health.

Note. Model fit:  $\chi^2(123) = 185.02$ ,  $p = 0.000$ , CFI = 0.97, TLI = 0.97, RMSEA = 0.04 (90% CI = 0.03–0.05), SRMR = 0.05; † < 0.07, \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

Further, being able to choose from several specifically tailored PA options also increases the likelihood of being able to engage in a PA that they can master, and thereby nurture their need for competence. To achieve this, the national public or local healthcare services should focus both on the Covid-19 related restrictions and the importance of PA for maintaining physical and mental health especially in vulnerable groups. At present, there is a wide variety of online PA opportunities for the general population, though there are less opportunities that are specifically designed for people with a range of different disabilities. Accordingly, promising positive results were found in a recent study of increasing PA through online/telehealth services conducted in a need supportive manner in line with SDT among people with Parkinson's disease.<sup>42</sup> However, there is still a lack of online PA offers that are easily accessible and tailored to the needs of the heterogeneous group of people with physical disabilities, who may have extra challenges with cognition, hearing and/or vision.

### Methodological considerations and future research

In Norway, there are ~600.000 people with a disability, with a considerable part having a physical disability. While we believe that the number of responses received in the present study is sufficient to answer the aims, we acknowledge that the sample is rather small. The participants reported a wide range of disabilities, which is a strength, as the findings may be generalized to several types of disabilities. Further, we cannot rule out selection bias as people that choose to participate in study like the current one may belong to the more physically active part of the population. The Covid-19 restrictions may have potentially had a greater effect in these more active participants as compared to people that were sedentary already before the pandemic. In addition, all variables investigated in this study may have been subject to self-reporting bias, in particular recall bias since most of the questions asked about retrospective experiences and likely an overestimation of one's own PA levels which is in line with previous research.<sup>43</sup> Further, the study design was cross-sectional, and we can thereby not conclude on any causal effects. Lastly, while the variables "basic psychological needs" and "mental health" were based on validated multi-item questionnaires, the measure of "change in PA" consisted of only one item. Retrospective change of PA, in the case of our study looking back to the period of march to mid-June 2021, compared to the same period a year prior, is a construct that is rarely investigated and may be subject to bias. In hindsight, we should have included a multiple-item measurement for the variable change in PA to obtain a more robust and valid variable. Concluding from the above, similar types of questionnaires including multi-item

measurements for change in PA are recommended for future similar studies in a larger sample of people with a physical disability.

### Conclusions

Overall, most of the participants, all of them with a physical disability, indicated that they had lower PA levels during the first wave of the Covid-19 pandemic. Alarming, about half of the participants reported a decrease in perceived health status with increased pain and reduced functioning in daily life, which may at least partly be attributed to the decrease in PA. Further, it is particularly important to nurture the basic psychological needs of autonomy and competence, as these were positively associated with change in PA and mental health. As such, the findings of the present study provide a good point of departure for designing interventions to increase PA and mental health in this population in case the Covid-19 restrictions continue, or similar situations arise in the future.

### Publishable statement

The authors declare no conflict of interest. This research received no external funding.

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### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.dhjo.2021.101126>.

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