

# Emotional distress and quality of life among adults with developmental coordination disorder during COVID-19

British Journal of Occupational Therapy

1–9

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DOI: 10.1177/03080226221126892

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## Abstract

**Introduction:** Individuals with developmental coordination disorder frequently report emotional and functional difficulties. A stressful era as COVID-19 pandemic may enhance emotional load. The present study aimed to (1) examine the emotional distress and quality of life among adults with developmental coordination disorder during COVID-19 as compared to typical controls, and (2) examine the relationships between these factors in adults with developmental coordination disorder.

**Method:** Participants were 317 adults, aged 18–66, recruited during the first year of COVID-19: 227 were included in the developmental coordination disorder group, and 90 in the control group (normal motor performance) based on the Adult Developmental Co-ordination Disorders/Dyspraxia Checklist cutoff score. Participants completed a sociodemographic health status/daily life under COVID-19 questionnaire and self-reports about their emotional status (depression, anxiety, stress) and a quality of life.

**Results:** The developmental coordination disorder group had significantly greater depression, anxiety, stress, and lower quality of life. Participants with developmental coordination disorder who were infected by COVID-19 or reported reduction of working hours due to COVID-19 had the lowest social and environmental quality of life. Depression significantly predicted reduced quality of life and mediated between developmental coordination disorder severity and quality of life.

**Conclusions:** Prevention and intervention programs for adults with developmental coordination disorder should be elaborated, with reference to emotional load and to implications on daily life, especially in times of crisis, like COVID-19.

## Keywords

Adults, developmental coordination disorder, emotions, daily life, COVID-19, quality of life

Received: 8 March 2022; accepted: 30 August 2022

## Introduction

Developmental coordination disorder (DCD) is a neuro-developmental condition of motor difficulties that interferes with academic achievement, activities of daily living, leisure, and play but does not result from a general medical condition (e.g., cerebral palsy; Diagnostic and Statistical Manual of Mental Disorders (5th edition; DSM–V; American Psychiatric Association (APA), 2013). Although DCD is mainly discussed in children, it may persist into adulthood in 30–70% of the cases (Tal-Saban et al., 2012). As in children, adults with DCD experience difficulties in daily activities and in interaction with the physical and social environments (Cleaton et al., 2019; Kirby et al., 2008). Adults with DCD frequently report on difficulties such as reduced academic performance, problems at work, and poor physical fitness (Kirby et al., 2013). Therefore, adults with DCD may be frustrated, show decreased competency, impaired self-esteem, limited participation in daily activities (Jarus et al., 2011; Tal-Saban et al., 2014), and reduced quality of life (QoL; Engel-Yeger, 2020). These negative impacts may

cause extreme emotional burden (Cairney and Veldhuizen, 2013). Nonetheless, most studies on emotional difficulties in DCD focus on children. Children with DCD may experience increased anxiety and even social phobia and obsessive compulsive disorder (Pratt and Hill, 2011). Interestingly, emotional burden in children with DCD may have direct effects on mood problems in adolescence (Wagner et al., 2011) and in adulthood (Kirby et al., 2013) and further deteriorate QoL (Tal-Saban et al., 2012). Hence, DCD in adulthood should be screened and treated to minimize its negative effects on individuals' function and wellbeing.

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Standardized tools for screening DCD in adults are missing. Moreover, it is of most importance to profile the implications of DCD on people's daily function (Cousins and Smyth, 2003; Kirby et al., 2008, 2010). The Adult Developmental Co-ordination Disorders/Dyspraxia Checklist (ADC) is a standardized measure which profiles motor performance with respect to daily life scenarios. The ADC may assist in screening DCD in adults and reflect functional limitations with regard to real-life context and life roles (Kirby et al., 2010). Based on accumulating research about the feasibility of the ADC, the present study uses this measure to screen for adults with DCD during COVID-19.

The novel Coronavirus Disease 2019 (COVID-19) identified in January 2020, has affected millions of people worldwide with reported case mortality rates of 0.3–19%.

The COVID-19 may cause a wide spectrum of symptoms that range from asymptomatic infection through significant symptoms such as fever, dry cough, dizziness, fatigue, shortness of breath, to life-threatening and fatal disease (Huang et al., 2020; Jiang et al., 2020). The variety of symptoms of COVID-19 may also include motor deficiencies. Medical reports mention ataxia, imbalance, muscles weakness (Abdelnour et al., 2020; Kong et al., 2020; Malayala and Raza, 2020; Sia, 2020) that are presented in the acute phase of COVID-19, as well as months thereafter (Maley et al., 2016). One explanation is that the massive inflammation caused by the viral infections triggers a wide spectrum of central nervous system anomalies that may lead to motor deficiencies as well (Mishra et al., 2020). This information is mainly gathered on clinical populations, with severe motor deficiencies such as individuals with Guillain-Barré (Scheidt et al., 2020), Spinal muscular atrophy (Veerapandiyam et al., 2020), Parkinson's disease (Cilia et al., 2020), and other vulnerable populations such as the elderly adults (Pera, 2020). Less is known about the relation between COVID-19 and "softer" motor impairments, in vulnerable groups, such as in people with DCD.

Moreover, this global health emergency and the catastrophic reality raised the emotional burden that people have experienced worldwide. The enforced social distancing and lockdowns and the extreme change in lifestyle, the economic downturn with the rise in unemployment (Brenner and Bhugra, 2020; Rajgor et al., 2020; Ugbolue and Duclos, 2020), elevated feelings of loneliness, depression, anxiety, and stress were resultant outcomes (Ali and Kunugi, 2020; Leane et al., 2020; Zheng et al., 2020). The physical, psychological, and socioeconomical related stressors as well as the drastic changes in daily routines, led to a steep reduction in people's QoL (An et al., 2020; Ugbolue and Duclos, 2020).

According to the World Health Organization (WHOQOL Group, 1995), QoL refers to the "individuals' perception of their position in life, in the context of the culture and value systems in which they live, and in relation to their goals, expectations, standards and concerns." QoL represents "physical health, psychological state, level of independence,

social relationships, personal beliefs and their relationships to salient features of the environment." Assessing the physical, social, psychological, and environmental QoL domains during COVID-19 is of most importance for understanding the implications of the pandemic on people's health, function and daily life, mainly in vulnerable populations that received less attention in the literature.

Taking it all together, COVID-19 may affect motor performance. Individuals with motor difficulties may be more vulnerable to COVID-19 effects. The knowledge about COVID-19 and DCD is limited. The relation between COVID-19 and the emotional burden of individuals with DCD was hardly studied. Therefore, this study aimed to elaborate the knowledge about COVID-19 and DCD in adults, and highlight their relation to emotional status, and QoL under COVID-19. This study specifically aimed to: (1) compare emotional status and QoL between adults screened as having DCD and adults with typical motor performance, during COVID-19; (2) examine the relationships between emotional status, QoL and restrictions known to affect these factors such as COVID-19 infection/severity, reduction of working hours due to COVID-19, in adults with DCD.

It was hypothesized that (1) emotional distress and reduced QoL would be significantly more prevalent in the DCD group as compared to the controls; (2) in adults with DCD, COVID-19 infection/severity, and restrictions would correlate with emotional distress and reduced QoL; (3) COVID-19 infection and emotional status would significantly predict QoL; (4) in the DCD group, emotional status would mediate between DCD severity and QoL.

## Method

### Participants

According to G-Power software (Faul et al., 2007), an effect size of .0625,  $p=0.05$  and power of 0.95, a total sample of 170 participants was recommended. The present study included 317 Israeli adults, in the age range of 18–66 years. Because of COVID-19 restrictions and the three lockdowns during this study performance (from May 2020 till May 2021), participants' recruitment and screening for DCD was performed via online standardized questionnaires. Online data collection enabled including people from various geographic regions in Israel.

Participants were divided into two groups, based on the cut-off score on the ADC (Kirby et al., 2010), and as presented in previous reports (e.g., Job et al., 2019): the DCD group which included participants who scored above 56 on the ADC and thus were screened as suspected for DCD ( $n=227$ ); participants with scores lower than 56 were defined as the control group with normal motor coordination ( $n=90$ ). Table 1 summarizes the participants' health-sociodemographic information, their work status during COVID-19, and their ability to keep their daily routines. Their socioeconomic level was determined based on the

**Table 1.** Comparing sociodemographic data, work status, and daily life during COVID-19 between groups.

	DCD group (n = 227)	Controls (n = 90)
Age		
Range	18–66	18–66
Mean ± SD	25.91 ± 8.39	26.58 ± 10.34
	n (%)	n (%)
Gender		
Men	48 (21.1)	19 (21.1)
Women	176 (77.5)	71 (78.9)
Missing	3 (1.4)	
Education level		
High school	120 (52.9)	43 (47.8)
Professional education	14 (6.2)	7 (7.8)
Academic	93 (41.0)	39 (43.3)
Missing		1 (1.1)
Familial socioeconomic status		
Low	109 (48.0)	43 (47.8)
Average	62 (27.3)	29 (32.2)
High	55 (24.2)	16 (17.8)
Missing	1 (0.4)	2 (2.2)
Went on unpaid vacation due to COVID-19	95 (41.9)	35 (38.9)
Experienced reduction of working hours due to COVID-19	94 (41.4)	39 (43.3)
Lost job due to COVID-19	45 (19.8)	13 (14.4)
Infected by COVID-19	35 (15.4)	8 (8.9)
Isolated due to personal/family members' COVID-19 infection	108 (47.6)	39 (43.3)
Keeping daily routine during COVID-19	126 (55.5)	56 (62.2)
Had accessible community services	206 (90.7)	83 (92.2)
Followed all COVID-19 restrictions	80 (35.2)	42 (46.7)

The frequency values related to COVID-19 infection and daily life represented the answer “yes.”

criteria of the Central Bureau of Statistics in Israel (2020). As presented in Table 1, the sample included more women than men; no significant differences were found between groups in the examined sociodemographic data, and daily routines/life roles. Significantly more participants in the DCD group were infected by COVID-19 as compared to the controls ( $X_1^2 = 3.62$ ,  $p < 0.05$ ). People with another severe systemic chronic disease (such as cancer), or with nervous system deficiencies (such as Parkinson's disease), or those taking medications that affect the function of the nervous system, were excluded from the study.

### Materials and measures

*Sociodemographic/health status and daily life under COVID-19 Questionnaire*—this questionnaire was composed for this study. In addition to sociodemographic data and health history/current status, it contained information about daily life under COVID-19 (such as being infected by COVID-19; unpaid vacation/reduction of working hours/job lost due to COVID-19).

### The Adult Developmental Co-ordination Disorders/Dyspraxia Checklist

The ADC (Kirby et al., 2010), is a screening tool for identifying DCD in adulthood. The ADC is a valid self-report

about the person's motor function, including motor organization in space and time during the performance of daily life, self-care skills, academic, and vocational activities (e.g., writing or driving), hobbies, and social participation. The ADC items support the DSM-V criteria for DCD (APA, 2013). The items are divided into three scales: (1) difficulties that the individual experienced as a child (distinguished from acquired problems in adulthood); (2) the individual's perception of his/her performance; (3) current feelings about the individual's performance as reflected upon by others. Answers are marked on a Likert scale whether this difficulty occurs “Never” (1) “Sometimes” (2), “Frequently” (3), or “Always” (4). Scores in each scale are summarized. Lower scores represent better performance. The ADC takes 15–20 minutes to complete. Participants who score at least 17 in Section 1 and 56 or above overall are defined as having possible DCD (Kirby et al., 2013).

*The Depression, Anxiety, and Stress Scale-21 (DASS-21)*—a self-report that includes 21 items that profile the person's emotional status, according to three scales: depression, anxiety, and stress. Each scale contains seven items. Respondents are asked to indicate how much each statement applied to them over the past week, on a 0 (“Did not apply to me at all”) to 3 (“Applied to me very much or most of the time”) scale. Scores for each scale are summarized. Higher scores represent worse emotional status. Cut-off scores exist for depression, anxiety, and stress level. However, the

**Table 2.** Comparing ADC scores, emotional status, and health related QoL between groups.

	DCD group (n = 227)		Controls (n = 90)		$F_{1, 315}$	$p$
	Mean	SD	Mean	SD		
ADC part A: as a child	17.68	5.01	11.38	1.54	137.63	0
ADC part B: current perception of motor performance	17.88	4.85	11.21	1.133	166.26	0
ADC part C: current feelings	38.92	7.11	26.93	3.21	236.51	0
ADC total score	74.49	12.87	49.51	3.84	$T_{315} = 18.08$	0
DASS depression	7.51	5.31	4.07	3.75	7.03	0.009
DASS anxiety	5.35	4.72	2.41	3.77	4.51	0.035
DASS stress	9.91	5.49	5.27	4.41	3.94	0.048
Physical QoL	64.96	18.67	75.53	14.71	22.42	0
Psychological QoL	64.81	18.27	74.25	15.87	18.71	0
Social HRQoL	62.91	23.73	72.28	17.61	18.62	0
Environmental QoL	67.41	14.91	73.19	12.79	9.36	0.002
Total QoL	64.73	15.71	73.81	11.72	$T_{315} = 5.61$	0

SD: Standard deviation.

DASS-21 is not a diagnostic tool (Lovibond and Lovibond, 1995).

*The World Health Organization Quality of Life Questionnaire, brief version (WHOQOL-BREF)*—which examines QoL in four domains: physical, psychological, social, and health related to environmental factors. Raw scores in each domain are summarized and then translated into percentage. Higher percentages represent higher QoL (WHOQOL-BREF, 1996).

### Procedure

After receiving ethical approval from the Ethical Committee of the Faculty of Social Welfare and Health Sciences, University of Haifa, Israel; reference number 2399 advertisements calling to participate in this study were published in the social media and on the faculty website. Individuals who were interested in participating in the study used a link to complete the online questionnaires, via google forms. No personal details were included, thus approving confidentiality and data security.

The online files included informed consent procedures—information was provided about the risks and the benefits of this study, that participation was voluntary, and that identity would not be disclosed. Questionnaires were completed in the following order: sociodemographic/health/daily life characteristics during COVID-19 questionnaire; the ADC, the DASS-21, and the WHOQOL-BREF.

### Data analysis

Data was analyzed using SPSS-25. Descriptive statistics was performed and normal distribution was found. MANOVA was used to examine the differences between groups in the measures' subscale scores. *t*-Test examined the differences between groups in the measures' total scores. Chi square analyzed the differences between groups in dichotomic

parameters. Pearson test examined the correlations between variables. A stepwise linear regression examined the relative contribution of COVID-19 infection and emotional status (depression, anxiety, and stress) to the prediction of each QoL domains among participants with suspected DCD. In the next phase, Hayes' (2019) PROCESS Model 4 was used to examine whether emotional status mediated between motor performance and QoL in the suspected DCD group. A *p*-value less than 0.05 was considered statistically significant.

### Results

Depression, anxiety, and stress were significantly higher in the DCD group as compared to the controls (see Table 2). However, no significant interactions were found regarding group (DCD or controls)—COVID infection, or group and other daily life characteristics (such as job loss).

Participants in the DCD group had significantly lower QoL, in all measured domains, as compared to the controls. A significant group (DCD or controls)—COVID infection interaction was found in Social QoL ( $F_{1, 305} = 4.75$ ,  $p = 0.03$ ): participants in the DCD group who were infected by COVID-19 had the lowest social QoL (mean = 58.35; SD = 28.05) as compared to those who were not infected (mean = 64.71; SD = 23.63), to controls who were infected by COVID-19 (mean = 80.95; SD = 14.99) or controls who were not infected by the virus (mean = 71.35; SD = 17.85). A significant interaction was found between group (DCD or controls) and the group of participants whose working hours were reduced due to COVID-19, in environmental QoL ( $F_{1, 305} = 6.21$ ,  $p = 0.013$ ). Participants with DCD whose working hours were reduced had the lowest environmental QoL (mean = 68.48.35; SD = 14.68). Participants in the control group had higher environmental QoL, irrespective of whether their working hours were reduced (mean = 70.27; SD = 12.31) or not (mean = 71.21; SD = 14.56). No significant interactions were found regarding group (DCD or controls)—and other daily routine changes.

**Table 3.** Correlations between motor coordination, emotional status, and QoL in the DCD group.

	ADC-A: as a child	ADC-B: current perception of performance	ADC-C: current feelings	ADC-total score
DASS depression	NS	NS	0.406***	0.296***
DASS anxiety	0.22***	NS	0.395***	0.333***
DASS stress	NS	NS	0.426***	0.315***
Physical QoL	NS	NS	-0.399***	-0.292***
Psychological QoL	NS	NS	-0.353***	-0.244***
Social QoL	NS	NS	-0.283***	NS
Environmental QoL	NS	NS	-0.249***	-0.236***
Total QoL	NS	NS	-0.396***	-0.280***

NS: not significant.

\*\*\* $p \leq 0.001$ .

Among the DCD group, most significant correlations between ADC subscales' scores, emotional status and QoL domains' scores were found in regard to ADC category 3—"Current feelings about the individual's performance as reflected upon by others"—greater difficulties in this category correlated with greater stress ( $r=0.43$ ,  $p<0.001$ ), anxiety ( $r=0.40$ ,  $p<0.001$ ), and depression ( $r=0.41$ ,  $p<0.001$ ) and with lower physical QoL ( $r=-0.40$ ,  $p<0.001$ ), Psychological QoL ( $r=-0.35$ ,  $p<0.001$ ), social QoL ( $r=-0.28$ ,  $p<0.001$ ), and Environmental QoL ( $r=-0.25$ ,  $p<0.001$ ). Similar trends were found in regard to the ADC-total score, that were probably impacted by ADC category 3 (see Table 3).

COVID-19 severity did not correlate with ADC scores. However, when examining the correlations between COVID-19 severity, emotional distress and QoL in the general sample, significant moderate-strong correlations were found between the measures. COVID-19 severity correlated with higher depression ( $r=0.79$ ,  $p<0.001$ ), higher anxiety ( $r=0.86$ ,  $p<0.0001$ ), with higher stress ( $r=0.65$ ,  $p<0.05$ ), and with lower QoL in all measured domains: physical ( $r=-0.61$ ,  $p<0.001$ ); psychological ( $r=-0.41$ ,  $p<0.001$ ); ( $r=-0.61$ ,  $p<0.001$ ); social ( $r=-0.33$ ,  $p<0.001$ ); environmental ( $r=-0.25$ ,  $p<0.001$ ); and total QoL ( $r=-0.48$ ,  $p<0.001$ ).

Among the DCD group, depression was the main predictor of all QoL domains: in Physical QoL—depression accounted for 29% of the variance ( $F_{1,165}=67.57$ ,  $p<0.0001$ ;  $B=-1.71$ ,  $SE=0.21$ ;  $\beta=-0.54$ ); anxiety added 2% to the prediction ( $F_{1,165}=6.03$ ,  $p=0.01$ ;  $B=-0.81$ ,  $SE=0.33$ ;  $\beta=-0.23$ ). In Psychological QoL, depression accounted for 43% of the variance ( $F_{1,165}=122.18$ ,  $p<0.0001$ ;  $B=-1.81$ ,  $SE=0.16$ ;  $\beta=-0.65$ ). In Social QoL, depression accounted for 24% of the variance ( $F_{1,165}=52.92$ ,  $p<0.0001$ ;  $B=-2.13$ ,  $SE=0.29$ ;  $\beta=-0.43$ ). In Environmental QoL, depression accounted for 11% of the variance ( $F_{1,165}=19.89$ ,  $p<0.0001$ ;  $B=-0.84$ ,  $SE=0.19$ ;  $\beta=-0.33$ ).

An indirect effect of DCD on QoL via the depression was tested using Hayes' (2019) PROCESS Model 4 (with 5000 samples). An indirect effect was found (95% CI [-0.29, -0.15]),  $F_{1,238}=47.09$ ,  $p<0.001$ ,  $R^2=0.41$ . The coefficient

was  $-1.65$ ,  $SE=0.14$ ,  $p<0.0001$ . Thus, depression mediated between DCD and QoL.

## Discussion

The present study aimed to elaborate the knowledge about the emotional distress and QoL of adults with DCD during COVID-19. The main results were that adults with DCD had greater emotional distress and lower QoL as compared to adults with normal motor performance. The worst emotional distress and QoL were found among adults with DCD who were infected by COVID-19 or whose working hours were reduced due to the COVID-19.

Greater emotional distress and lower QoL were previously reported in adults with DCD (Campbell et al., 2012; Miyahara and Piek, 2006; Tal-Saban et al., 2014). Studies found that emotional distress correlated with DCD severity (Li et al., 2019) and that QoL was reduced, mainly in the social, psychological, and environmental domains (Engel-Yeger, 2020). However, the present study, performed during the COVID-19, found that the physical QoL domain was also significantly lower in adults with DCD. The threat of COVID-19 on people's physical health, as well as the fact that some of the participants were infected by COVID-19, may explain this result. Yet, the present study was a cross-sectional study. Based on reports highlighting the emotional burden of long COVID (Ramakrishnan et al., 2021; Sykes et al., 2021) and the related low QoL (Malik et al., 2022), cohort studies should examine whether emotional status and QoL of adults with DCD deteriorate, especially among those who were infected by COVID-19. These studies should profile the related emotional and QoL domains that were mostly affected in order to better tailor prevention and intervention programs related to long COVID effects.

Interestingly, the present study did not find significant correlations between COVID-19 severity and DCD severity, probably due to the relatively low number of participants that were infected by the virus. Yet, both COVID-19 severity and DCD severity correlated with greater emotional distress and lower QoL. Most correlations were found with the ADC-3rd scale, that focuses on "Current feelings about the

individual's performance as reflected upon by others." The current experience of life crisis, and the fragile emotional state of people with motor coordination difficulties, may explain this result.

Furthermore, in the current study, depression was found to be the significant predictor of all QoL domains. Kirby et al. (2013), also found that depression was the main player in predicting QoL of individuals with DCD. The finding according to which depression mediated between DCD and QoL, emphasized its significant effects on QoL, even among adults with mild DCD severity.

The interrelations between DCD–emotional status and daily life may be also explained via the model suggested by Cairney et al. (2013) and Pearlin's stress process model (Pearlin, 1989).

Pearlin's model depicts the direct and indirect connections between exposure to stress and psychological distress. Cairney et al. (2013) applied Pearlin's model on children with DCD. According to Cairney et al. (2013), DCD itself is a main stressor because of the difficulties and functional obstacles that individuals with DCD face in their daily lives. This main stressor may provoke secondary stressors that catalyze internalizing problems (such as symptoms of depression and anxiety). Yet, factors within the child are not a solid player. Environmental factors might buffer secondary stressors and enhance symptoms of depression and anxiety. However, social support and feelings of positive self-perception may reduce emotional distress. Although Cairney et al. (2013) referred in their model to children with DCD, this model may be relevant for adults with DCD as well. Adults with DCD experience functional, academic, social challenges which in turn enhance their psychological distress. These negative outcomes may be more emphasized in times of catastrophes caused by environmental factors, such as COVID-19. The severe effects of the virus on people's health, the extreme and fast changes in daily routines, the lockdowns, the social distance, the economic burden, may cause fear, worry, despair, and significantly increase emotional burden (Wang et al., 2022). This may be more emphasized in people with DCD that experience functional obstacles, frustration, and distress in routine lives. As in the model of Cairney et al. (2013), the stress factors and related psychological difficulties may enhance interpersonal conflicts, lead to lower perceived social support and negative self-concept, which in turn elevate the risk for anxiety and depression. Therefore, coping mechanisms should be provided to individuals with DCD in order to minimize the negative personal-environmental effects on their wellbeing. As suggested by Cairney et al. (2013), social support and feelings of positive self-perception can serve as coping resources for managing emotional distress and should be augmented in adults with DCD, especially in risk times such as COVID-19 era.

The present study also highlighted that social/environmental QoL were the lowest among participants with DCD who were infected by COVID-19 or whose working hours

were reduced due to the pandemic. Studies about the relation between DCD and work are scarce. Kirby et al. (2013) found that emotional status, and mainly depression, correlated with unemployment of adults with DCD and low levels of life satisfaction. Hence, COVID-19 infection as well as its effects on work (and related economic distress), may further deteriorate emotional status, social relationships, and QoL, especially in vulnerable populations such as adults with DCD. Support for that may be found when analyzing the items included in the Environmental QoL domain of the WHOQOL-BREF used in the present study, such as: "How safe do you feel in your daily life?"; "Have you enough money to meet your needs?"; "To what extent do you have the opportunity for leisure activities?"; "It may be suggested that COVID-19 and related restrictions have caused people to feel unsafe, worry about their physical status (as well as their family's health), and about their economic status. The resulting emotional burden may restrict social life, including the opportunities to participate in leisure activities because people focus on surviving and adapting to the catastrophe. These results, as well as previous reports about the relation between environmental factors and emotional distress in DCD (Dyck and Piek, 2010), highlight the need to further explore the DCD-emotional status-environment-QoL complexity, in research and practice. Elaborating this knowledge may elevate the awareness of stakeholders and health services, to the necessity of developing and optimizing health and community services for adults with DCD, which will include: early emotional support, environmental accessibility including information about existing intervention programs, social support, and working opportunities/adaptations or financial support, especially in times of distress. This approach may reduce the obstacles that people with DCD face in their daily life and elevate their wellbeing.

### Implications for occupational therapists

Occupational Therapy services for adults with DCD should be elaborated and include prevention and intervention programs. These programs should start from early screening of adults with DCD; refer to the various possible negative implications of DCD on emotional status, daily function, life roles and QoL; profile their specific needs; provide coping strategies to enhance function and participation in their real-life context. Occupational therapists should elevate the awareness of individuals with DCD, their families, as well as stakeholders to the difficulties that adults with DCD face, particularly in times of distress; collaborate with health services when relevant, to optimize health status and life experience of adults with DCD.

### Limitations and future directions

This study was conducted during the first year of COVID-19 pandemic. The knowledge about the experiences of the

participants in the following year of COVID-19 is missing. This study included a relatively small sample of participants infected with COVID-19. The general sample also included more women than men. The size of the study group and the control group was not equal. Since no clinical diagnosis of DCD exists for adults, the inclusion in the DCD group was defined based on the cutoff score of the valid questionnaire—the ADC. Information was gathered online, because of COVID-19 restrictions, and Quarantines.

## Future research

Further studies, on larger samples of people with DCD affected by COVID-19, with similar ratio of gender and other sociodemographic parameters, with longitudinal perspectives, and in various age groups and countries, should be performed in order to better understand the long-term effects of COVID-19 on individuals with DCD. These studies should use an elaborated perspective that refers to the interaction between body dysfunctions (such as physical, emotional) and daily life.

## Conclusions

DCD may persist into adulthood, affect emotional status and reduce QoL. Emotional overload and functional difficulties (at home, at work, in the community) may be enhanced in times of distress as the COVID-19 era. Therefore, vulnerable populations, as people with DCD, should receive greater attention. Health and community services should provide mental and social support to people with DCD, to elevate their positive self-perception and optimize their coping with the obstacles enforced by the new reality. Research and practice should further examine the long-term consequences of the pandemic on individuals with DCD, using a vast perspective that considers physical/mental health, function, and QoL, in various age groups and countries. The cumulative knowledge may contribute to prevention and intervention programs to minimize the negative effects on daily life experiences and well-being.

### Key findings

- Adults with DCD experience greater emotional burden and lower QoL during COVID-19, compared to typical controls.
- COVID-19 infection and restrictions deteriorate emotional status and QoL of adults with DCD.
- DCD intervention should refer to emotional load and daily life challenges, especially in times of distress.

### What the study has added

This pioneering study about adults with DCD during COVID-19 illuminates their vulnerability to the negative impacts of COVID-19 infection and daily restrictions on their emotional status and QoL.

## Acknowledgements

The authors thank Keren Talisa; Noa Ichia; Adi Samuels; Eden Fingerhot Yael Mordechi; Noa Segev; Reut Shimon; and Shiran Menachem for their help in collecting part of the data.

## Research ethics

This study was approved by the Ethical Committee of the Faculty of (BLINDED; reference number 2399).

## Patient and public involvement data

During the development, progress, and reporting of the submitted research, Patient and Public Involvement in the research was included in the conduct of the research.

## Consent

Participation in the questionnaires was voluntary; participants were informed of all uses of their data before proceeding.

## Declaration of conflicting interests

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

## Contributorship

BEY and AE researched literature. AE provided the medical knowledge relevant to COVID-19 and DCD in this paper. Both authors were involved in protocol development. BEY and her students distributed the online questionnaire and performed the data analysis. Interpretations of results was performed by both authors. Both authors reviewed and edited the manuscript and approved the final version of the manuscript.

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