

## THE ASSOCIATION BETWEEN UPPER DISORDERS AND PSYCHOLOGICAL WELL-BEING AND ITS IMPLICATION IN TEXT NECK SYNDROME: A SYSTEMATIC REVIEW

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## Abstract

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**Objective:** Non-specific/chronic musculoskeletal disorder in neck, head or low back (that we called Upper Disorders; UD) are widely common health problem in high-income, urban, and industrialized countries, especially for sedentary people who use electronic devices. This systematic review aims to analyse the association between UD and psychological disease.

**Method:** The database searches were conducted in 8 different databases, using relevant keywords. According to PRISMA Statements, full-text peer-reviewed articles in English which analysed the association between UD and indicators of psychological disease (i.e., mood disturbance, anxiety, depression, stress, social support, and alexithymia) in non-clinical sample were included.

**Results:** Of 8798 abstracts and titles, 10 full-text papers were included. The overall results showed a strong association between UD and mood disturbance, anxiety, depression, stress, alexithymia, and low social support. Thus, high levels of UD were associated with high levels of psychological disease.

**Conclusions:** The results supported the assessment of physical and psychological symptoms in a holistic perspective. Their implications in terms of holistic care and text neck syndrome were discussed.

**Key words:** neck, head, low back, psychological disease, text neck syndrome, holistic care

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Non-specific musculoskeletal disorder in the upper part of the body— e.g., neck pain, head pain, and low back pain (for a more practical presentation, we called these physical symptoms as *upper disorders*; UD)— are widely common health problem in high-income, urban and industrialized countries (Altuğ et al., 2015; Safiri et al., 2020), having an age-standardised prevalence rate of 27.0 per 1000 population in 2019 (Kazeminasab et al., 2022). They were associated with disability, especially for sedentary people (e.g., office worker, students, etc.) with an impact on economics and public health: it may cause decrees in productivity, absence to work, sleep disturbance, and reduction in quality of life (de Cássia Pereira Fernandes et al., 2016; Fandim et al., 2021). Faced with increasingly sedentary lifestyles, this health condition may become chronic and persistent (Kim et al., 2018).

The link between physical and psychological conditions is now established (Caretti et al., 2021; Ohrnberger et al., 2017; Surtees et al., 2008; Valenti et al., 2021), especially for pain (Batley et al., 2019; Iijima et al., 2018; Zhang et al., 2022). Previous research supported the association between psychological disease of general population and their UD (Croft et al., 2001). Recently, a literature review (Kazeminasab et al., 2022) highlighted a high prevalence of UD in people with any type of mental disorders — particularly

for mood disorders— than that of those without a mental disorder. Moreover, the psychological risk factors (e.g., long-term stress, lack of social support, anxiety, depression, low sleep quality, and alcohol consumption) were correlated with the severity of the pain. Similarly, some studies (Linton, 2000; Liu et al., 2018; Mork et al., 2020; Ortego et al., 2016) overall focused on four psychological domains (i.e., cognitions, emotions, social, and behavioral domains) to explore the association between psychological aspects and UD: all findings supported the association of psychological variables with UD to further support a deep connection between mind and body. Furthermore, the Bone and Joint Decade 2000-2010 Task Force of Neck Pain and Its Associated Disorders supported a worse prognosis for patients who live psychological distress (Haldeman et al., 2008).

A recent systematic review (Jahre et al., 2020) supported that the risk factor to develop UD were associated with the use of mobile electronic devices. Among others, the text neck syndrome (TNS) might be considered as an emerging consequence or “the pain of modern era” (David et al., 2021; Kumari et al., 2021). This clinical condition can be firstly described by an US chiropractor, Dr. Fishman (Fishman) as «overuse syndrome involving the head, neck, and shoulders, usually resulting from excessive strain on the spine

from looking in a forward and downward position at any hand-held mobile device (i.e., mobile phone, video game unit, computer, mp3 player, e-reader). This can cause headaches, neck pain, shoulder, and arm pain, breathing compromise, and much more». A longitudinal study (Hestbaek et al., 2006) estimated that 75% of world's population daily use their devices with a bad posture of upper body with negative consequences for their psycho-physical health from adolescence to adulthood.

Recent research (David et al., 2021; Kumari et al., 2021) highlighted the characteristics of this complex syndrome: (i) pathology (i.e., the weight of the head increased when it is flexed forward with worse consequences of increasing the angle of neck curvature); (ii) clinical features (e.g., they can involve eyes, head, and psychological disease); (iii) musculoskeletal pain; (iv) eyes symptoms; (v) electromagnetic risk (e.g., difficult sleeping, dizziness, and headaches); (vi) psychosocial effect (e.g., isolation, worry, irritability, stress, anxiety, panic disorder, poor communication, and decreased productivity); (vii) further comorbidities (i.e., cardiovascular problems and pulmonary disease). Moreover, it is also essential to pay attention to the psychological aspects — in addition to the physical ones— for a holistic perspective.

Most sectorial studies (e.g., physiatrist, orthopaedics, motor science) have focused only on the physical symptoms such as UD. However, the focus on psychological issues it is crucial to outline a global knowledge of health, especially for the TNS implications. Moreover, it is also advisable to prevent harmful behaviours, thoughts and emotions associated with the wide use of mobile electronic devices. The aim of this study was to systematized the knowledge around the association between physical (i.e., UD) and psychological disease as a perspective on general health. In other words, the research question was: UD are associated with psychological disease? The present contribution may be also valuable for its pioneering implication in TNS: according to the current knowledge and in line with the worldwide spread of mobile electronic devices, it would be not viable to regard as merely the physical symptoms alone. The focus on the psychological implications could allow the implementation of prevention and intervention programs in line with the complexity of the syndrome.

## Methods

### Search strategy

We used the Preferring Reporting Items for Systematic Reviews and Meta-Analyses guidelines (PRISMA) to report the following results (Moher et al., 2009). We screened the paper published in the follow electronic databases: Pubmed, MEDLINE, PsycARTICLES, PsycINFO, Psychology and Behavioral Sciences Collection, Wiley Online Library, and Web of Science. This search has been enriched by manual analysis of other sources, such as Google Scholar and first screened articles' reference lists (figure 1). No criteria were specified in relation to publication year.

The searched keywords (in title and abstract) were: (1) text neck or neck flexion or neck pain or head flexion or head pain or neck posture or head posture; (2) emotion or mood or feeling or affect or feelings or emotional state or psychological effects or mental health or psychological well-being or psychological impact. An author first screened titles and abstracts of

potential included articles in light of the inclusion and exclusion criteria. An independent author reviewed some (approximately 30%) of the originally selected articles. No divergences between authors in the inclusion or exclusion judgments were found. We choose to not include unpublished studies for the reason presented in Ferguson and Brannick (2012) such as the possibility that unpublished work may be methodologically poor. Including unpublished studies might increase rather than decrease risk of bias, as well.

### Eligibility criteria

Studies that explore the association between physical symptoms of UD and psychological disease were selected. Inclusion criteria were: (1) quantitative studies, written in English language and published in peer-reviewed journals; (2) the variables should refer to UD (e.g., non-specific/chronic neck or head or back pain) and psychological aspects (e.g., emotions, psychiatric symptoms, etc.) as variables; and (3) studies that includes non-clinical sample (i.e., the pain should be non-specific and not due to specific medical pathology). Exclusion criteria were: (1) studies with pain caused by a specific disease (e.g., neck or head cancer, disc erniation); (2) studies that focused only on physical symptoms; (3) studies which not use neck/head pain and/or psychological disease as predictors variables; and (4) reviews, books, abstract, case report, and doctoral theses.

### Coding and Evaluation of Included Study

Data were independently extracted by the two authors and cross checked. They were organized in an Excel format which included the identification of paper, year of publication, country, sample size and its characteristics (i.e., mean age and standard deviation), assessed instrument, study design (i.e., cross-sectional or longitudinal), measures of UD, measures of psychological disease, and a brief narrative presentation of relevant results. No divergences were found between authors (see table 1 for included studies). According with Cochrane NIH Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies (Health, 2021), the authors also independently evaluated and summarized the selected studies' quality. No divergences between authors were found (these results are outlined in supporting information table S1). Most of them had fair quality. In particular, most studies have not a sample size justification, a power calculation and effect size estimation. In most cases, the potential confounding variables were not measured. Moreover, the two authors also independently evaluated and summarized the risk of bias (Liu et al., 2015) which mostly were moderate (these results is outlined in supporting information table S2).

### Data Synthesis

Due to the heterogeneity of the included studies, two different procedures sections were created for the synthesis of the results. First, we synthetized the studies which included various indicators or measures of psychological disease (e.g., anxiety, stress, alexithymia, social support, and mood disturbance) associated with UD. Secondly, we presented the results around depression symptoms, which were the most frequent psychological effects detectable in literature.

**Table 1. Selected studies**

Paper	Year	Country	Sample N	Mean Age	SD	Measure of Upper Disorders	Measures of Psychological Disease	Study design	Narrative Relevant Results
Altuğ et al., 2015	2015	Turkey	50 Group I (Chronic low back pain) 50 Group II (Chronic neck pain)	Group I 39.7 Group II 45.44	Group I 9.71 Group II 10.39	Oswestry Disability Index, Neck Disability Index	Visual Analog Scale, Beck Depression Scale	Cross-sectional (between subjects)	It was found a significant difference between group I (Chronic Low Back Pain) and group II (Chronic neck pain) in results of emotional status. These scores were ground highest in patients with low back pain.
Blozik et al., 2009	2009	Germany	448			Neck Pain and Disability Scale German Version	Hospital Anxiety and Depression Scale	Cross-sectional	Depression and anxiety were highly significantly linked with increasing levels of neck pain. In addition, deficits in social support were associated with neck pain.
Elbinoune et al., 2016	2016	U	80	51.8	11.8	Medical informations	Hospital Anxiety and Depression Scale	Cross-sectional	The cervicobrachial neuralgia (CBN) was significantly associated with depression. In multivariate analysis, pain intensity and CBN were independently associated with anxiety and depression, respectively.
Fares, Fares, & Fares, 2017	2017	Lebanon	180	14	U	Neurological assessment to test sensory and motor deficits	Ad hoc questions	Cross-sectional	Parents of children with non-specific neck pain reported a change in the psychological and social behavior of their children and decline in school performance.
Mehling & Krause, 2005	2005	California	1180	46.4	7.9	Information from medical documents	Toronto Alexithymia Scale (TAS-20)	Cross-sectional	The results support an association between alexithymia and low back pain. This association was stronger in women than in men. The factory "difficulty identifying feelings" showed the strongest association with low back pain.
Pollock et al., 2011	2011	Australia	1258	14.07	0.18	Body Mass Index	Beck Depression Inventory for Youth	Part of longitudinal project	Girls with medium and high depressed mood were significantly more likely to report neck/shoulder pain than girls with low depressed mood. Depressed mood was also a significant correlate of neck/shoulder pain in boys after controlling for covariates, although the association was substantially weaker.
Shahidi, Curran-Everett, & Maluf, 2015	2015	Colorado	171	Not Chronic neck pain: 30.2 Chronic neck pain: 29.8	8.3 6.8	Neck Disability Index	Beck Depression Inventory, Spielberg State-Trait Anxiety Index, Perceived Stress Scale, Pain Catastrophization Scale, Minnesota Satisfaction Questionnaire, Job Content Questionnaire, and medical/ neuropsychological assessment	Longitudinal	Development of chronic interfering neck pain was predicted by depressed mood at baseline.

**Table 1. Continued**

Suzuki et al., 2021	Japan	2021	20	19.85	1.04	Medical informations	Ad hoc questionnaires and objective measures	Experiment	The effect of head inclination on the psychological state was only partially significant. The findings imply that focal length, rather than head inclination, primarily affected psychological states. It is noteworthy that previous studies' results regarding the effect of head inclination on emotional states may have mistakenly indicated a relationship because focal length coincides with head inclination.			
Xu et al., 2021	China	2021	28140	U	U	Composite International Diagnostic Interview, World Health Organization Disability Assessment Schedule	Composite International Diagnostic Interview, World Health Organization Disability Assessment Schedule	Part of a large-scale and nationally representative community survey of adult respondents on mental health disorders in China	It was found by logistic regression that mood disorders showed stronger association with chronic back or neck pain than anxiety disorders and substance disorders.			
Van Der Windt et al., 2007	Netherlands	2007	171	42	U	U	Catastrophising of the Coping Strategies Questionnaire, the four-item physical activity subscale of the Fear-Avoidance Beliefs Questionnaire, Four-Dimensional Symptom Questionnaire	Longitudinal	In patients with LBP, psychological factors were more strongly associated with distress.			

Note. UD = upper disorders  
U= undetectable



## Results

### *Description of included studies*

The first screen of selected electronic databases provided 8798 studies. We removed 5 duplicates with EndNoteX9 software, and we selected 10 studies in accordance with our eligibility criteria (**figure 1**). The studies were conducted in different countries (i.e., Turkey, Germany, Lebanon, California, Australia, Colorado, Japan, China, and Netherlands). Findings were collected from 2270 participants (range = 20–1180) with a mean age of 33.42 ( $SD = 17.65$ ); their study design was 50% cross-sectional and 50% longitudinal or part of a longitudinal project. The measures of UD were predominantly medical indices such as the Neck Disability Index (NDI; Vernon et al. (1991); on the other hand, the measures of the indicators of psychological disease were mostly the Beck Depression Inventory (BDI;  $N = 5$ ; Beck et al., 1996), the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983), the Toronto Alexithymia Scale (TAS-20; Bagby et al., 2007), the Catastrophising of the Coping Strategies Questionnaire (Hirsh et al., 2007), or ad hoc questionnaires.

### *The association between head/neck pain and psychological disease*

Five studies analyzed the association between various indicators of psychological disease and UD in both cross-sectional and longitudinal design (for more information, see **table 1**). The mood disorders were stronger associated with UD (Xu et al., 2020), especially distress (Van Der Windt et al., 2007). In a cross-sectional study, Blozik et al. (2009) highlighted that anxiety symptoms and low social support increased the levels of UD. In light of the Elbinoune et al. (2016) multivariate analysis, the association between anxiety and neck pain was independent to others indicators of psychological disease (e.g., depression). The positive correlation between alexithymia and UD was studied in Mehling and Krause's (2005) research which particularly supported a strong association with the factor "difficulty identifying feeling", especially for women. The parents of children with UD reported a negative influence on their social and psychological behavior with negative impact on school performance (Fares et al., 2017). However, a recent experimental research (Suzuki et al., 2021) emphasized the importance of the focal length reader than head inclination (i.e., the main cause of UD) for the effects on emotional well-being: it was supported that it would be precisely the focal length to have effects on the emotional state and that this has been confused with the inclination of the head because they coincide.

### *The association between head/neck pain and depression*

Finally, five studies highlighted the association between UD and depression (Blozik et al., 2009; Elbinoune et al., 2016; Fares et al., 2017; Pollock et al., 2011; Shahidi et al., 2015). This association was showed also in predictive (Fares et al., 2017) and multivariate analysis (Elbinoune et al., 2016), in which the UD was independently associated with depression. Particularly, Pollock et al. (2011) supported that girls with high or medium levels of depression symptoms were more likely to report UD than girls with low depression

symptoms. Moreover, this association was reported in boys, although the association was substantially weaker.

## Discussion

The goal of this systematic review was to analyse previous research examining the association between UD and psychological disease. To the best of our knowledge, the results are limited in psychological area, with most of the published papers focused more on physical symptoms and their medical implications. However, this information is relevant in terms of the holistic concept of human care (e.g., in the cognitions, emotions, social and behavioral domains) and pioneering for their implications in widespread use of mobile electronic devices and consequent TNS. Generally, the quality assessment of included studies was fair and the evaluation of risk of bias was moderate: this may be due to the complexity of the requirement assessment (i.e., medical and psychological assessment) that potentially include various health professions (e.g., psychologist, neuropsychology, doctors, and sports science experts). Indeed, the required multidimensional assessment can generate very complex research designs and, consequently, the choice of less articulated but easier methodologies (for example, the longitudinal research could be very difficult though more informative in terms of causation). However, these can also be a strength for holistic research, looking at the complexity of the human health. Future research should be carried out in multidisciplinary teams able to return a true picture of human complexity, often too fragmented by a parcelled knowledge.

The overall results supported an association between UD and psychological disease in both cross-sectional and longitudinal design. The psychological disease's indicators, such as mood disorders, anxiety symptoms, and distress were associated with UD (Blozik et al., 2009; Van Der Windt et al., 2007; Xu et al., 2020). As a clinical implication, the assessment of UD should be considered in a holistic perspective, especially if were parts of TSN (David et al., 2021; Kumari et al., 2021). Indeed, acting exclusively on physical symptoms may not be a solution to the disease and the psychological symptoms could remain ignored: the psychological assessment of clinical variables, such as anxiety, depression, and stress, represent an indispensable global point of view for people who suffer for UD. Moreover, the previous research showed that low social support was reported in people with UD (Blozik et al., 2009). As a possible explanation, in line with previous research (Blozik et al., 2011) with highlighted that there were no robust evidences of the effectiveness of widely used medical care options for UD (e.g., exercise, manipulation and mobilisation, acupuncture, or injection therapies), people who suffers for UD could perceive less social support, having to rely only on their ability to resist pain. Additionally, the difficulty to identifying feeling (i.e., one of the alexithymia's components) was associated with UD (Mehling & Krause, 2005). However, in light of self-medication hypothesis of addictive disorders (Suh et al., 2008) and the more recent trauma model (Schimmenti et al., 2022), the emotion dysregulation—which was proposed as a way to counteract negative feelings that are not mentalized and to avoid mental and behavioral dysregulation in these pathological disease and which is very often linked to traumatic experiences (Schimmenti et al., 2017)—had a negative impact on interoceptive awareness. Based on these findings, the difficult to identify feeling related to the problematic

use of mobile devices could manifest in addition to psychological disorders even in incorrect body postures which generated the UD. Further research should study the physical correlates of psychological disorders within increasingly complex theoretical frameworks and adhering to real and complex human experience. As a clinical implication, the primary care should also consider emotional aspects when intercept UD. In fact, behind a request for treatment for UD could be hidden more prone psychological needs (e.g., online addictive behaviors, emotion dysregulation). As a medical-practice implication, it might be the task of those who intercept these medical needs (e.g., basic medicine), not limiting themselves to prescribing analgesics to treat the medical symptom for a better resolution of the disorder.

Further, many studies supported the association — but also the predictive rule (Fares et al., 2017)— of depression and UD (Blozik et al., 2009; Elbinoune et al., 2016; Pollock et al., 2011; Shahidi et al., 2015). According to the *embodiment* research (Niedenthal, 2007; Niedenthal et al., 2005)— which assumed that the facial expression or body posture influenced the way in which emotions were processed and vice-versa— and in line with previous studies (Asadi-Melerdi et al., 2020) that showed the association between depression and cranio-vertebral angle, people who placed in a hunched, threatened physical posture reported more negative self-perception (Riskind et al., 1982). As a practical implication, innovative clinical approaches (e.g., biofeedback) could offer clinical treatments that act together on the body and mind. Based on these considerations, further research should consider the implication of physical evaluation during psychological assessment to improve innovative care pathways based on the indissoluble relationship between mind and body. In fact, even during psychological assessment the physical variables must be taken into account: the excessive sectionalisation of knowledge can negatively affect the patient care. Finally, Fares et al., (2017) showed the negative implication of UD in terms of school performance (i.e., decrease productivity in terms of TNS) and social behaviors in children. As a possible explanation, the pain could reduce the ability to concentrate and socialize but, in light of the more complex TNS, the use for many hours of electronic devices could distance children from their responsibilities and peers. As a practical implication, the parents should focus on their children's physical symptoms and, through a multifactorial perspective, learn to bring them back to broader psychological dynamics. Future research should deepen the TNS in children in a longitudinal perspective, especially for their implications on children's psychological and social health.

### Study limitations

It is essential to highlight that the results presented here should be interpreted with caution. First, the small number of included studies (i.e., 10) did not allow a thorough understanding of the phenomenon. However, this first review may help to highlight a gap in knowledge. In these studies, the differences in sample size and methods (i.e., cross-sectional and longitudinal) could have resulted in distortions in the comparison of findings. However, the limited number of included studies has not made possible a better specification. Also, the heterogeneity of the results did not allow to compare the results in terms of effect size (ES) and some needed psychometrics to estimate the ES would not have been traceable.

### Conclusion

This review identified an association between UD and psychological disease and discussed its implication in terms of holistic care and TSN. According to the widespread diffusion of mobile electronic devices and its negative consequences on mental health, the results supported the assessment of physical and psychological symptoms as strongly interconnected. Moreover, in line with the rapidly development in body-oriented psychotherapy [e.g., Ogden's sensory-motor psychotherapy (Ogden & Minton, 2000); mindful awareness in body-oriented therapy (MABT; Price & Hooven, 2018); Muscle relaxation therapy (MRT; Conrad & Roth, 2007)], especially for psychosomatic disorders (Röhrich 2009), our findings support the potential of psychotherapy to act on a physical as well as mental level. In fact, the emotional dysregulation underlying many mental deficits (e.g., resulting from traumatic experiences) can benefit from a therapy based not only on speech, but also on attention to the body and its signals. Consequently, the UD should not be considered only as a non-specific/chronic physical symptom: the associated mood disturbance, anxiety, stress, depression, and alexithymia united with low social support could be alarm bells for very complex health situations (i.e., TSN). In this perspective, the basic medicine has a privileged point of view: to be able to intercept apparently unrelated symptoms to a holistic approach. In light of the small number of included studies, further research should limit sectoral perspectives on health issues and encourage multidisciplinary approaches that can better represent complex human health.

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