Examining the role of traditional masculinity and depression in men's risk for contracting COVID-19

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Abstract

Background: In the light of the COVID-19 pandemic and claims that traditional masculinity may put some men at increased risk for infection, research reporting men's health behaviors is critically important. Traditional masculine norms such as self-reliance and toughness are associated with a lower likelihood to vaccinate or follow safety restrictions. Furthermore, infection risk and traditional masculinity should be investigated in a differentiated manner including gender role orientation, underlying traditional masculine ideologies and male gender role conflict.

Methods: In this pre-registered online survey conducted during March/April 2021 in German-speaking countries in Europe, 490 men completed questionnaires regarding contracting COVID-19 as confirmed by a validated test, fear of COVID-19 (FCV-19S), and experience of psychological burden due to COVID-19. In addition, depression symptomatology was assessed by using prototypical internalizing and male-typical externalizing depression symptoms. Furthermore, self-identified masculine gender orientation, endorsement of traditional masculine ideologies, and gender role conflict were measured.

Results: A total of 6.9% of men ($n = 34$) reported having contracted COVID-19 since the beginning of the pandemic. Group comparisons revealed that men who had contracted COVID-19 exhibited higher overall traditional masculine ideology and gender role conflict. Logistic regression controlling for confounders (age, income, education, and sexual orientation) indicated that only depression symptoms are independently associated with the risk of having contracted COVID-19. While prototypical depression symptoms were negatively associated with the risk of having contracted COVID-19, male-typical externalizing depression symptoms were positively associated with the risk of having contracted COVID-19.

Conclusion: For traditional masculinity, no robust association for an increased risk of contracting COVID-19 could be established, while higher male-typical externalizing depression symptoms were associated with an increased risk of having contracted COVID-19.

Key words: Traditional masculinity; traditional male role norms; COVID-19; depression; MDRS-22

Public significance statement: Understanding the factors that contribute to increased risk of contracting COVID-19 is essential to developing tailored prevention strategies. Traditional masculinity appears only modestly related with an increased risk of contracting COVID-19, while for elevated levels of male-typical externalizing depression symptoms rooted in traditional masculine ideologies, robust associations emerged. Men in the present sample with high externalizing depression symptoms appear to be more likely to contract COVID-19.

1 Introduction

The COVID-19 pandemic poses major health and economic ramifications worldwide and effectively responding to the pandemic remains an ongoing challenge. Investigation of the pandemic is critical to ending it, and better controlling future pandemics (Li et al., 2021). As one such central concept that might underlie the increased spread of the COVID-19 virus, traditional masculinity is increasingly coming into focus (Bridges et al., 2021).

Although men and women were infected with COVID-19 to a similar extent at the beginning of the pandemic, men were much more likely to die from COVID-19 (Peckham et al., 2020). Research indicates that the cause of the increased mortality rate in infected men was not rooted in male biology but in men's health risk behaviors such as smoking and drinking, which can complicate COVID-19 infections and may lead to a more severe disease course (Hamer et al., 2020; Peckham et al., 2020). Traditional masculinity in connection with health risk behavior has become increasingly important in explaining why specific sub-populations adhere less to state-imposed protective measures such as mask wearing or show increased mortality (Bridges et al., 2021).

Traditional masculinity has long been related to men's health risk behaviors (Courtenay, 2000; Harrison, 1978). This is reflected by consistent findings of gender differences emerging from the current pandemic showing that men were found to be more likely than women to downplay the risks associated with COVID-19 (Umamaheswar & Tan, 2020). Men were also less likely than women to report fearing "very serious" consequences if they became infected (Babalola et al., 2020; Capraro & Barcelo, 2020). Men in general were also less likely to follow public health protocols (Clark et al., 2020; Haischer et al., 2020), including refusing to wear masks, demonstrating greater negative affect towards wearing a mask, and less reported handwashing and social distancing compared to women (Capraro & Barcelo, 2020; Haischer et al., 2020; Okten et al., 2020). Relative to women, men are more likely to believe that wearing a face mask is embarrassing or a sign of weakness (Capraro &

Barcelo, 2020) and Palmer and Peterson (2020) specifically linked stronger endorsement of the traditional male role norm of toughness with greater levels of negativity towards mask wearing. Taken together, men in general show poorer adherence to protection measures and health behaviors and therefore are at increased risk for contracting COVID-19 as compared to women (Capraro & Barcelo, 2020; Cassino & Besen-Cassino, 2020; Mahalik et al., 2021; Palmer & Peterson, 2020).

These hesitant attitudes and behaviors to follow state-imposed protection measures for ending the COVID-19 pandemic by many men appear to be based on socially constructed and idealized male gender norms of strength, toughness, and self-reliance adopted during men's gender role socialization (Levant & Richmond, 2015; O'Neil, 2013). Thus, studies comparing men with low and high adherence or conformity to traditional male role norms should provide further insight into the relation between traditional masculinity, following protection measures and the risk for contracting COVID-19. However, to date there are few available studies on this topic. A non-peer reviewed but publicly available report highlighted those men who identified as "completely masculine" were nearly three times more likely to report having been diagnosed with COVID-19 than men self-identifying as "mostly masculine" or "slightly masculine" (Dan Cassino, 2021). Furthermore, the same authors reported that men self-identifying as "completely masculine" expressed less intention to get vaccinated for COVID-19 as men self-identifying as "mostly masculine" or "slightly masculine" (Cassino & Besen-Cassino, 2020). Mahalik and colleagues provided preliminary evidence that higher conformity to traditional masculine norms is associated with negative attitudes toward mask wearing during the ongoing pandemic and that conformity to traditional masculine norms interacts with more conservative political ideologies for the prediction of mask wearing attitudes (Mahalik et al., 2021).

The relationship between traditional masculine role norms and health behaviors or health outcomes in general is, however, complex. Greater adherence to traditional masculinity

was initially associated with worse health behaviors or increased mortality (Lippa et al., 2000). A meta-analytic investigation revealed that conformity to traditional masculine norms is associated with overall worse mental health outcomes and reduced help seeking (Wong et al., 2017). Moreover, studies indicate traditional masculinity to be associated with delayed therapy initiation (Eggenberger et al., 2021), and increased risk for suicide (Coleman et al., 2020; Walther, Grub, Tsar, et al., 2021). However, more recently also positive and health promoting aspects of traditional masculinity are being recognized (Gerdes & Levant, 2018). The conceptualization and operationalization of masculinity has evolved over time with its beginning in the gender role identity paradigm attributing gender-typical traits to men and women (Bem, 1974; Pleck, 1981) being followed by the gender role strain paradigm focusing on the adherence and conformity to traditional masculine role norms (Levant et al., 1992; Mahalik et al., 2003; O'Neil et al., 1986). Based on the social constructionist understanding of masculinity Levant and Wimer (2014), for example, revealed that conforming to certain masculine norms act as protective buffers for some health behaviors, while others are consistently identified as risk factors. This was corroborated in a subsequent study showing that the traditional masculine role norm of primacy of work was mostly related with positive health outcomes, while for four other role norms (winning, risk-taking, pursuit of status, and disdain for homosexuals) a balance of positive and negative health outcomes was observed (Gerdes & Levant, 2018). Yet, six subscales (emotional control, violence, power over women, dominance, playboy, and self-reliance) were predominantly related to negative health outcomes (Gerdes & Levant, 2018). Therefore, besides reliance on total scores of commonly used masculinity measures, which often obscure the complexity of associations, subscales highlighting particular male role norms should be investigated and reported.

In addition, it is increasingly being discussed whether individuals with mental disorders might be at increased risk for contracting COVID-19 due to potential cognitive deficits including executive dysfunction, negative health behaviors (e.g. smoking), or

structural barriers hindering the ability to successfully quarantine at home (Shinn & Viron, 2020; Yao et al., 2020). While there are reports suggesting depression is associated with an increased risk for contracting COVID-19 (Chang et al., 2020; Tang et al., 2020; Taquet et al., 2021; Wang et al., 2021), a similar number of studies found no association or a reduced risk for contracting COVID-19 in these individuals (Izurieta et al., 2021; Jeon et al., 2021; Nemani et al., 2021; Salvatore et al., 2021). There is also evidence that some individuals intentionally expose themselves to the virus with the intent of self-harm or to suicide, further suggesting increased risk for contracting COVID-19 among individuals with mental health problems (Ammerman et al., 2021). However, a meta-analysis examining the relation between mood disorders and risk of contracting COVID-19 in over 91 million individuals could not identify significant associations, suggesting the need to examine more specific subgroups regarding this question (Ceban et al., 2021).

As no association was identified in the above-mentioned meta-analysis on the relation between mood disorders and the risk of contracting COVID-19 (Ceban et al., 2021), it emerges as relevant to investigate a more fine-grained research question regarding how certain disorders, and indeed their unique symptomatology, are associated with a risk of contracting COVID-19. Considering that individuals with prototypical depression symptoms such as depressive mood, anhedonia, or fatigue show increased social withdrawal, higher rates of social isolation and unemployment, one would assume a reduced risk of contracting COVID-19 due to the reduced social interactions (Ceban et al., 2021). By contrast, men with high traditional masculinity exhibit more male-typical externalizing depression symptomatology (Eggenberger et al., 2021; Rice et al., 2013; Walther & Seidler, 2020), which is characterized by anger and aggression, risk taking, or substance misuse (Cavanagh et al., 2017; Martin et al., 2013; Rice et al., 2013; Walther, Grub, Ehlert, et al., 2021; Winkler et al., 2005). Such a symptom pattern might be assumed to be associated with an increased risk of contracting COVID-19. Risk-taking, for example, is characterized by not caring about the

consequences of one's actions, so men experiencing externalizing depression symptomatology may care less about their own well-being as well as the well-being of those around them.

The aim of the present study was to investigate the relationship between traditional masculinity measured by different conceptual constructs (gender role orientation, traditional masculine ideology, gender role conflict), depressive symptomatology (prototypical and male-typical externalizing depression symptoms) and self-reported infection with COVID-19. Based on the outlined literature, we hypothesize traditional masculinity to be positively associated with having contracted COVID-19. We hypothesize this relationship uniformly for all masculinity constructs and their respective subscales. The a priori formulated directed hypothesis are retrievable under OSF (<https://osf.io/q4pw3/> [embargo till 2021/12/31]). To better understand the relation between specific depression symptomatology and risk of contracting COVID-19, we further investigated in an explorative manner whether men with higher prototypical depression symptoms are less likely to have contracted COVID-19 and whether men with higher male-typical externalizing depression symptoms are more likely to have contracted COVID-19.

2 Methods

2.1 Sample and Procedure

This anonymous, cross-sectional online survey entitled ‘Men’s Mental Health in Times of COVID-19’ was pre-registered and approved by the local ethics committee of the Faculty of Arts and Social Sciences of the University of Zurich (Authorization No. 21.2.4). Following the Open Science standards, a priori defined study hypotheses, statistical analyses, and the study specific data set can be retrieved from OSF (<https://osf.io/q4pw3/> [embargo till 2021/12/31]). For this study, male participants were recruited via advertisements distributed on social media platforms such as Facebook and the study’s webpage. Advertisements on social media platforms were restricted to men of 18 years or older in the countries Germany,

Switzerland, Austria, Lichtenstein, Luxembourg, and Belgium. Aiming to recruit a large sample of men older than 18 years with sufficient German language skills to read and respond to the questionnaire in German language, all men irrespective of mental health status were eligible to participate. During the recruitment period from 15th March 2021 to 28th April 2021 a total number of 1087 people expressed interest in this study by visiting the starting page of the online questionnaire. A little more than half of the initially interested participants ($n = 597$, 54.92%) were not included in the final analyses for one of the following reasons: data privacy agreement not provided, declaration of consent not provided, self-reported insufficient German language skills, gender requirements not fulfilled, age of minority and/or incomplete data in the questionnaires. This resulted in a total number of 490 participants included in the analyses. Figure 1 presents participant flow. After providing written informed consent at the beginning of the survey, participants agreed to the data privacy statement and then went on to answer sociodemographic questions, COVID-19-related questions, and a set of psychometric instruments. For the subsequently described study, the average completion time was 20 minutes. However, several participants went on to participate in further online experiments following the completion of initial questionnaires, which are beyond the scope of this report. Further information on the study is provided elsewhere (Walther, Grub, Tsar, et al., 2021) or on the preregistration in OSF (<https://osf.io/q4pw3/> [embargo till 2021/12/31]).

2.2 Instruments

2.2.1 Sociodemographics and COVID-19 related questions

The online survey started with sociodemographic questions assessing sufficiency of German skills, gender, dimensional gender (positioning between the two poles 1 = masculine, 10 = feminine), age, height, weight, nationality, relationship status, sexual orientation, education, and the household's yearly gross income. Participants were further asked whether a validated test confirmed that they were currently infected with COVID-19 or whether a

validated test has previously confirmed that they had contracted COVID-19 since the beginning of the pandemic (yes/no). If participants answered "yes" to this question, they were asked which symptoms from a given list they currently or previously suffered from due to COVID-19 infection (e.g., respiratory symptoms, cardiovascular symptoms, fatigue, fever, pain symptoms, post exertional malaise, cognitive symptoms, nausea, etc.). The list of symptoms was based on previous research investigating COVID-19 and long COVID symptoms (Sudre et al., 2021). Further descriptives are presented in Table 1.

2.2.2 Bem Sex-Role Inventory - Masculinity (BSRI-M)

Consisting of a masculinity and a femininity scale, the Bem Sex Role Inventory (Bem, 1974) measures masculinity and femininity independently as a two-dimensional construct. Each scale contains personality characteristics or traits that were selected as masculine or feminine based on sex-typed social desirability (Bem, 1974). In the present study, a validated German version of the 30-item short version scale was used (Troche & Rammsayer, 2011). To identify the degree of self-identified masculine gender orientation, the masculinity subscale BSRI-M was used (Cronbach's $\alpha = .83$; Troche & Rammsayer, 2011). The participants had to specify for each of the 15 items how well the items matched their self-perception on a seven-point Likert scale ranging from 1 (never or almost never true) to 7 (always or almost always true). Cronbach's α in the current study was .90.

2.2.3 Male Role Norm Inventory – Short Form (MRNI-SF)

The Male Role Norms Inventory – Short Form (MRNI-SF; Levant et al., 2013) consists of 21 items and measures traditional masculine ideology with seven subscales. The participant indicates the degree to which he agrees with traditional masculinity ideology statements on a seven-point Likert scale (1 = strongly disagree, 7 = strongly agree). The seven subscales of the MRNI-SF represent the following dimensions: restrictive emotionality, self-

reliance through mechanical skills, negativity toward sexual minorities, avoidance of femininity, importance of sex, dominance, toughness. A Cronbach's alpha of $\alpha = .92$ for men has been reported for the original English version of the MRNI-SF (Levant et al., 2013). Cronbach's α in the current study: MRNI-SF total score = .94, MRNI-SF negativity toward sexual minorities = .87, MRNI-SF restrictive emotionality = .74, MRNI-SF self-reliance through mechanical skills = .88, MRNI-SF avoidance of femininity = .88, MRNI-SF importance of sex = .88, MRNI-SF dominance = .88, MRNI-SF toughness = .81.

2.2.4 Gender Role Conflict Scale – Short Form (GRCS-SF)

The Gender Role Conflict Scale (O'Neil et al., 1986) measures patterns of gender role conflicts. The Gender Role Conflict Scale-Short Form (Wester et al., 2012) measures the following four patterns of gender role conflict: 1) success, power, and competition (SPC), 2) restrictive emotionality (RE), 3) restrictive affectionate behavior between men (RABBM), and 4) conflict between work and family relations (CBWFR). Consisting of a total number of 16 items, four items are dedicated to each pattern of GRC. The participants indicate the degree of experienced conflict on a six-point Likert scale (0 = strongly disagree, 5 = strongly agree). Wester and colleagues (Wester et al., 2012) reported internal consistencies of $\alpha = .77 - .80$. The German version of the Gender Role Conflict Scale – Short Form (Komlenac et al., 2018) was used in the present study. Cronbach's α in the current study was at .79.

2.2.5 Patient Health Questionnaire-9 (PHQ-9)

The Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001) assesses nine symptoms of major depressive disorder specified by the Diagnostic and Statistical Manual of Mental Disorders 5 (DSM-5; American Psychiatric Association, 2013). For each of the nine symptoms the participants rate how often they appeared within the preceding two-week period on a four-point Likert scale ranging from 0 (not at all) to 3 (almost every day). The

PHQ-9 is applied in criteria-based diagnoses of depressive disorders with a cut-off ≥ 10 within research and clinical practice (Levis et al., 2020) and has been shown to provide a reliable and valid measure of depression severity (Kroenke et al., 2001). In this study a German version of the PHQ-9 was used, which has been previously validated on a representative German-speaking sample (Cronbach's $\alpha = .89$; Martin et al., 2006). Cronbach's α in the current study was at .90.

2.2.6 Male Depression Risk Scale-22 (MDRS-22)

The Male Depression Risk Scale (MDRS-22; Rice et al., 2013) consists of 22 items assessing externalizing depressive symptoms. For each item, the participant rates how often the symptom appeared within the preceding month on an eight-point Likert scale ranging from 0 (not at all) to 7 (almost always). The scale consists of six domains and considers gender-specific externalizing symptoms of depression and assesses them within the context of cultural norms related to masculinity. The six domains of the MDRS-22 include emotion suppression (i.e., "I bottled up my negative feelings"), drug use (i.e., "I used drugs to cope"), alcohol use (i.e., "I needed to have easy access to alcohol"), anger and aggression (i.e., "I overreacted to situations with aggressive behaviors"), somatic symptoms (i.e., "I had regular headaches"). In the present study the validated German version of MDRS-22 was used (Guttman's $\lambda_2 = .62 - .91$; Walther, Grub, Ehlert, et al., 2021). Cronbach's α in the current study was at 0.88.

2.2.7 Fear of COVID-19 Scale (FCV-19S) and COVID-19 Pandemic Stress Scale (CPSS)

As measures for the evaluation of discriminant validity with regard to depression measures, we included the German version of the fear of COVID-19 scale (Ahorsu et al., 2020) consisting of 7 items where participants have to indicate the extent to which they do agree with the statements on fear of COVID-19 on a five-point Likert scale (1 = do not agree

at all; 5 = fully agree). Cronbach's α in the current study was at .85. We further included the German version of the COVID-19 Pandemic Stress Scale consisting of 10 items on aspects and consequences of COVID-19 such as hygienic behavior rules, contact restrictions, or actual fear of COVID-19 infection (Werner et al., 2021). The participants had to rate how stressed or anxious they felt about these topics during the last 2 weeks on a four-point Likert scale (0 = not burdened at all, 4 = very burdened). Cronbach's α in the current study was at .74.

2.3. Statistical Analysis

The statistical analyses and computations were performed with the software R (R Core Team, 2020) and the supplementary packages "psych" (Revelle, 2020); calculating internal consistencies, effect sizes, and correlations), "car" (Fox & Sanford, 2019); estimating variance inflation factors), "rcompanion" (Mangiafico, 2021); MLE estimation of goodness-of-fit indices for logistic regression models), and "ggplot2" (Wickham, 2016); data visualization). The subsamples used for the analyses described in the following were obtained by dividing the participants into two groups consisting of men who (previously or currently) tested positive for COVID-19 and men who never tested positive for COVID-19. While for the initial analyses a significance level of $\alpha = .05$ was used, a sequential Holm-Bonferroni correction for multiple testing was applied post-hoc to control for alpha inflation due to the multiple comparisons with identical statistical endpoints (Holm, 1979). Additionally, due to the a-priori formulated hypothesis, one-sided hypothesis tests were used in all the analyses involving traditional masculinity constructs (BSRI, MRNI, GRCS, including all their subscales). Lastly, statistical assumptions were assessed using Levene's test for homogeneity of variance (Levene, 1961) for the *t*-tests and the generalized variance inflation factor (Fox & Monette, 1992) as well as Cook's distance (Cook, 1977) for the logistic regression models.

Initially, sample characteristics were obtained by calculating mean scores and frequency distributions for the total sample as well as for the two subgroups separately. Additional t - and χ^2 -tests were then used to test for statistically significant group differences between the two subgroups. Secondly, correlational analyses were conducted by calculating Pearson's correlation coefficient for the relevant variables and subsequently testing their significance with two-sided t -tests. Thirdly, logistic regression analyses were performed to assess the predictive value of depressive symptoms, traditional masculinity, fear of COVID-19 and COVID-19 pandemic related stress. These regression models included the participant's age, income, education level, and sexual orientation as covariates. In a last part, a more explorative approach was used to assess a possible association between traditional masculinity and COVID-19 symptoms. For this purpose, men who have contracted COVID-19 were divided into two subgroups using median division of the variables assessing the traditional masculinity constructs so that men with high and low traditional masculinity could be identified and compared with regard to displaying specific COVID-19 symptoms. Wald-tests were then used to determine significant differences in the frequency of COVID-19 symptoms and t -tests were used to determine significant differences in the mean scores of the remaining questionnaires used in the study.

3 Results

3.1 Descriptive Statistics and Group Differences in Men with and without COVID-19 Infection

Out of the 490 men participating in the survey, 34 (6.9%) previously or currently tested positive for COVID-19, which corresponded to the COVID-19 positive rates at that time for the surveyed countries Germany (4.1%), Austria (6.9%), and Switzerland (1.5%). Their age ranged from 18 to 68 years old, with a mean age of 25.7 years. The majority of the participants originated from Germany (73.1%) and Switzerland (14.5%), self-identified as

heterosexual (73.7%), were single (63.5%), and had completed secondary education (71.0%). More detailed sample demographics can be found in Table 1.

Regarding group differences (Figure 2, S-Table 1), men who have contracted COVID-19 had significantly higher MRNI scores on the total scale (Cohen's $d = .44$) as well as on the MRNI subscales assessing *Restrictive Emotionality* (RE; $d = .38$), *Importance of Sex* (IS; $d = .31$), *Dominance* (D; $d = .55$), and *Toughness* (T; $d = .30$). Similarly, men who had contracted COVID-19 also had significantly higher GRCS scores on the total scale ($d = .40$) as well as on the subscale measuring *Success, Power, Competition* (SPC; $d = .38$). However, none of these effects remained significant after applying the Holm-Bonferroni correction for multiple testing.

3.2 Correlational Analysis

As presented in Table 2, the PHQ-9 was significantly positively correlated with the MDRS-22 ($r = .64$), the GRCS ($r = .41$), the FCV-19S ($r = .29$), and the CPSS ($r = .31$), while also being significantly negatively correlated with the BSRI ($r = -.36$). The MDRS-22 was significantly positively correlated with the MRNI ($r = .18$), the GRCS ($r = .38$), the FCV-19 ($r = .28$), and the CPSS ($r = .28$). The BSRI was only significantly positively correlated with the MRNI ($r = .33$) while also being significantly negatively correlated with the FCV-19S ($r = -.16$). The MRNI was again significantly positively correlated with the GRCS ($r = .39$) and significantly negatively correlated with the FCV-19S ($r = -.15$). The GRCS was significantly positively correlated with the FCV-19S ($r = .18$) and the CPSS ($r = .24$). Lastly, the FCV-19S was significantly positively correlated with the CPSS ($r = .58$).

3.3 Logistic Regression predicting COVID-19 Infection

For the binary logistic regression analysis, two models were fitted due to singularities in the covariance matrices caused by perfect linear combination among the MRNI total score

and its subscales, as well as the GRCS and its subscales. The first model therefore included the total scores of the MRNI and the GRCS as predictors for a COVID-19 infection (S-Figure 1, S-Table 2) and revealed the PHQ-9 ($OR = 0.91 [0.83 - 0.99]$, standardized $OR = 0.53 [0.30 - 0.93]$) and the MDRS-22 ($OR = 1.03 [1.00 - 1.05]$, $OR_{std.} = 1.66 [1.04 - 2.65]$) to be the only two significant predictors for a COVID-19 infection. The second model included only the subscales of the MRNI and the GRCS instead of the total scores, but still the same two predictors emerged as significant (PHQ-9: $OR = 0.89 [0.81 - 0.98]$, $OR_{std.} = 0.47 [0.25 - 0.85]$; MDRS-22: $OR = 1.02 [1.00 - 1.05]$, $OR_{std.} = 1.64 [1.01 - 2.66]$). Both models therefore indicate higher PHQ-9 scores to be associated with a lower likelihood to have contracted COVID-19 and higher MDRS-22 scores to be associated with a higher likelihood to have contracted COVID-19. However, these results also became non-significant after applying the Holm-Bonferroni correction for multiple testing. Nonetheless, further post-hoc analyses favored the first model with the total scores of the MRNI and the GRCS ($BIC = 297.7$, $\chi^2(11) = 23.7$, $p = .015$) as a better overall fit in predicting a COVID-19 infection as compared to the second model including only the subscales of the MRNI and the GRCS ($BIC = 349.3$, $\chi^2(20) = 27.8$, $p = .114$).

3.4 Group Differences in Men with low and high Traditional Masculinity

An explorative analysis was taken to further examine possible associations between high traditional masculinity, COVID-19 symptoms and depressive symptomatology in men who contracted COVID-19. Here, only the subsample consisting of 34 men was used. As can be seen in Figure 4A, men with high traditional masculinity operationalized as high BSRI scores exhibited less general (i.e., pain symptoms, headache, joint pain, muscle pain, peripheral neuropathy) pain symptomatology (47.4%) as compared to men with low traditional masculinity (80.0%) ($\chi^2(1) = 4.22$, $p = .040$, $OR_{std.} = 0.17 [0.03 - 0.84]$) and lower PHQ-9 scores ($M = 9.2$, $SD = 5.7$) as compared to men with low traditional masculinity ($M =$

13.9, $SD = 6.3$) ($t(32) = -2.26$, $p = .031$, $d = .37$). Furthermore, as can be seen in Figure 4C, men who experienced higher gender role conflict exhibited higher MDRS-22 scores ($M = 44.5$, $SD = 21.5$) as compared to men who experience lower gender role conflict ($M = 23.8$, $SD = 23.1$) ($t(32) = 2.70$, $p = .011$, $d = .43$). However, these results also faded after applying the correction for multiple testing.

4 Discussion

4.1 Summary of results

The present study examined the interaction between mental health outcomes, traditional masculinity and COVID-19 infection. The first set of hypotheses postulated that higher expression of traditional masculinity constructs (gender role orientation, traditional masculine ideologies, gender role conflict) would be associated with a higher likelihood of having contracted COVID-19. Although group comparisons between men infected with COVID-19 and those without infection showed that infected men exhibit significantly elevated scores of traditional masculine ideologies and gender role conflict (but not gender role orientation), this could not be confirmed in the logistic regression models controlling for the confounders of age, income, education, and sexual orientation. Notably, when applying correction for multiple testing, the significant group differences did not hold.

In a second step the hypotheses that men with elevated prototypical depression symptoms would have a lower risk of being infected with COVID-19, whereas men with elevated male-typical externalizing depression symptoms would have an increased likelihood of being infected with COVID-19 were tested. Although this tendency was observable in the group comparisons, no significant group differences emerged. However, these hypotheses were confirmed subsequently in the logistic regression analyses controlling for confounders. It is important to note that when the Holm-Bonferroni correction for multiple testing was applied, the significant effects did not hold.

4.2 Integration of findings

The results partly support our assumption that higher expression of traditional masculinity (MRNI-SF and GRCS-SF but not BSRI-M) is associated with a higher likelihood of having contracted COVID-19. Two out of the three masculinity measures were significantly elevated in the group of men reporting having contracted COVID-19 since the beginning of the pandemic as compared to men without known COVID-19 infection. Specifically, for endorsement of traditional masculine ideologies (MRNI-SF), the subscales of restrictive emotionality, importance of sex, dominance, and toughness were elevated in the men with a positive COVID-19 test, while for gender role conflict (GRCS-SF), the subscales of power, competition, and success were elevated. These findings are consistent with previous studies showing that adherence to traditional masculine norms is associated with engagement in risky health behaviors in men (Iwamoto et al., 2011; Levant & Wimer, 2014). The present study thereby partly corroborates previous literature on traditional masculinity and health behaviors in general, but also with regard to mask wearing during the current pandemic (Mahalik et al., 2021); extending it with regard to the most critical outcome to fight the current Corona pandemic, namely contracting COVID-19.

Importantly, a non-peer reviewed report examining over 6,000 adults suggested that men self-identifying as “completely masculine” were almost three times more likely to contract COVID-19 than men self-identifying “mostly masculine” or “slightly masculine” (Cassino et al., 2021). Data stemming from the present study could not confirm such a direct association for any of the three validated masculinity measures highlighting three potential explanations for the observed lack of direct association. Firstly, it could be that included confounders (age, education, income, sexual orientation) better explain COVID-19 infection risk than traditional masculinity. Secondly, the study might have been underpowered to detect a signal due to the number of positive COVID-19 infection cases. Thirdly, it is imaginable

that using validated masculinity scales reveal a more complex picture than reported by Cassino et al. (2021) using a single item to measure masculinity. This is in line with a previous report suggesting that total scores obscure the complex relation between several traditional masculine norms and health behaviors or outcomes (Gerdes & Levant, 2018). This study further highlighted that in using the CMNI with its subscales as a measure for conformity to traditional masculinity, 30% of the findings reflected beneficial associations with specific masculine role norms and health or well-being outcomes, especially for health promotion. Therefore, the observed findings of uniformly increased traditional masculinity in the group having contracted COVID-19 (see Figure 2) are pointing towards a relation between traditional masculinity ideology and COVID-19 infection risk, although the Holm-Bonferroni correction renders the effects null. A further study from our workgroup is currently underway with the goal of replicating the observed findings with the advantage of accessing a larger population of contracted individuals with less time restrictions for recruitment due to the largely stabilized pandemic situation.

The fact that men with high traditional masculinity exhibit worse health behaviors including more risk-taking and less mask-wearing (Mahalik et al., 2021), and thus are exposed to a higher risk of infection, also further explains why men are more likely to die from COVID-19 as compared to women (Hamer et al., 2020; Peckham et al., 2020). The present study sheds light on why men, and particularly men with high traditional masculinity, may be at increased risk for contracting COVID-19, and thus potentially at increased mortality as shown in previous longitudinal studies (Coleman et al., 2020; Lippa et al., 2000).

Furthermore, results supported the exploratory hypotheses that higher prototypical depression symptoms (PHQ-9) are associated with a reduced risk of contracting COVID-19, while higher male-typical externalizing depression symptoms (MDRS-22) are associated with an increased risk of contracting COVID-19. This finding is new insofar that no previous study has examined prototypical and male-typical externalizing depression symptoms in parallel

with regard to the risk of contracting COVID-19. The observation that prototypical depression symptoms – probably due to their relation with a general social withdrawal – are associated with a reduced infection risk, has previously been reported by independent studies (Ceban et al., 2021a). However, the contrary or a null association has also been reported several times (Chang et al., 2020; Tang et al., 2020; Taquet et al., 2021; Wang et al., 2021), suggesting that this relationship is either non-existent or depends on examined subgroups and the specific depression symptomatology exhibited. A previous study from our workgroup examining adult men's psychotherapy use found that only higher male-typical externalizing depression symptoms, but not prototypical depression symptoms, predicted lower psychotherapy use (Eggenberger et al., 2021). Similarly, male-typical externalizing and prototypical depression symptoms were shown to differ in predicting past-month suicide attempt (Rice et al., 2019; Walther, Grub, Tsar, et al., 2021). These findings support the notion that internalizing and externalizing psychopathology are differentially related to health behavior risk and specifically to the risk of contracting COVID-19. Yet it is also relevant that COVID-19 increased the risk of suffering from depression measured with the PHQ-9 more than 3-fold (Ettman et al., 2020), which additionally highlights the importance to understand which individuals suffer from which depression symptoms and whether they are at particular risk of contracting COVID-19.

In summary, the present data support the hypothesis that traditional masculinity and the presence of male-typical externalizing depression symptoms may be associated with an increased risk of contracting COVID-19. Therefore, health promotion campaigns should specifically target these men, as they might be relatively poorly informed due to a more indifferent attitude based in traditional male role norms of toughness and self-reliance, or in extreme cases these men may also deliberately infect themselves with COVID-19 to self-harm or suicide (Ammerman et al., 2021). One way to address this problem would be to appeal to the role of protector and provider and ask men with high traditional masculinity to protect

others and not put them in danger, which also means protecting themselves so as not to be carriers of the virus.

Mental health care specialists should pay particular attention to men with high traditional masculinity and male-typical externalizing depression symptoms and inform them about the detrimental personal and societal consequences a careless spreading of the virus has. The effect men with high traditional masculinity and male-typical externalizing depression symptoms have in spreading the virus and thereby prolonging the current pandemic situation is difficult to identify. Nevertheless, informing men and the entire health care system about the crucial role men with high traditional masculinity may play in this pandemic is of vital importance. However, the use of a strength-based approach by appealing to the role of protector and provider or good leader may be all the more promising in limiting the risk of COVID-19 infection by men with high traditional masculinity as a means of protecting significant others.

It is important to note, however, that the present findings can only be considered preliminary results, since limited power led significant results to fade after correction for multiple testing. Due to a time-sensitive measurement period in the COVID-19 pandemic, it was not possible to recruit participants for a sufficiently long period and therefore only a small sample of 490 men in total and 34 currently or previously COVID-19 infected men could be obtained. Therefore, the present findings based on the a priori formulated hypotheses are to be considered tentative. The observation that findings uniformly fade when applying correction for multiple testing is, however, also to be interpreted with caution since no prior results on this specific research question is available and potentially a substantially larger sample size would be required to uphold the small to moderate findings in the range of statistical significance due to small number of positive COVID-19 cases. Due to the time restrictions set by a dynamic pandemic situation, this poses a major challenge for research and thus corrections for multiple testing must be placed in perspective.

Of further interest are the observations regarding traditional masculinity and specific COVID-19-related symptoms (see Figure 4). A detailed discussion of these findings is provided in the Supplementary.

4.3 Limitations

When interpreting the study results, some limitations should be taken into account. First, the cross-sectional design only provides information about associations and no causal conclusions can be drawn from the results. Furthermore, the sample with a total of 490 men and only 34 men with a reported COVID-19 infection is not sufficiently powered to identify small effects. Therefore, all significant results faded after the Holm-Bonferroni correction. Furthermore, the main outcome measure of a positive corona infection by a validated test has been self-reported, and because of insufficient data, little can be said about its reliability despite its high face validity. It also becomes evident from the descriptive data showing a high percentage of men suffering from a psychological disorder or suicidal thoughts, that this is a sample of adult men with high psychological distress, which makes it difficult to generalize to the male population as a whole. Lastly, it should be noted that the PHQ-9 and MDRS-22 depression scales, while very well validated measures of depression, are not capable of identifying depressive disorders and thus interpretations regarding depression status and risk for contracting COVID-19 in men need to be made on syndrome level, while a clinical diagnostic interview enabling differential diagnosis would be preferable.

4.4 Conclusion

Taken together, men exhibiting higher traditional masculinity and higher male-typical externalizing depression symptoms may be at increased risk for contracting COVID-19 and should be informed by health care campaigns and mental health care specialists. Appealing to these men's provider and protector role might partially counter the overall detrimental effects

of high traditional masculinity without challenging the endorsement of traditional masculinity ideology itself. The potential effect men with high traditional masculinity and increased male-typical externalizing depression symptoms have in prolonging the current pandemic is difficult to identify. More research using validated traditional masculinity measures combined with larger samples including more men with current or past COVID-19 infections is needed.

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Author contribution

Design and conceptualization of the study: AW, JG, UE; Participant recruitment and testing: AW, JG; Data analysis and visualization: LE, AW; Data interpretation: AW, LE; Writing of the first draft: AW, LE; Editing of subsequent versions: AW, UE, ZES, SMR, DK, JSO, JLO.

Conflict of interest statement

The authors declare no conflict of interest.

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Table 1. *Descriptive Statistics for the Sample*

	Total (N = 490)		No CV19 (N = 456)		CV19 (N = 34)		test-statistic (df)	p
	N (%)	M (SD)	N (%)	M (SD)	N (%)	M (SD)		
Age		25.7 (9.8)		25.7 (9.8)		25.9 (9.5)	-0.10 (448)	.924
Nationality							26.63 (6)	< .001***
Swiss	71 (14.5)		62 (13.6)		9 (26.5)			
German	358 (73.1)		342 (75.0)		16 (47.1)			
Austrian	43 (8.8)		36 (7.9)		7 (20.6)			
Luxembourger	4 (0.8)		4 (0.9)		0 (0)			
Liechtensteiner	1 (0.2)		1 (0.2)		0 (0)			
Belgian	1 (0.2)		0 (0)		1 (2.9)			
Other	12 (2.4)		11 (2.4)		1 (2.9)			
Sexual orientation							0.88 (4)	.927
Heterosexual-identified	361 (73.7)		334 (73.2)		27 (79.4)			
Gay/Lesbian-identified	39 (8.0)		37 (8.1)		2 (5.9)			
Bisexual-identified	67 (13.7)		63 (13.8)		4 (11.8)			
Asexual-identified	5 (1.0)		5 (1.1)		0 (0)			
Other	18 (3.7)		17 (3.7)		1 (2.9)			
Marital status							1.45 (2)	.484
Single	311 (63.5)		291 (63.8)		20 (58.8)			
In a relationship	168 (34.3)		154 (33.8)		14 (41.2)			
Separated after permanent relationship	11 (2.2)		11 (2.4)		0 (0)			
Education							3.69 (3)	.296
None completed	10 (2.0)		10 (2.2)		0 (0)			
Secondary education	348 (71.0)		325 (71.3)		23 (67.6)			
Tertiary education	106 (21.6)		99 (21.7)		7 (20.6)			
Other	26 (5.3)		22 (4.8)		4 (11.8)			

Yearly household income (in CHF)					1.88 (2)	.392
< 25'000	233 (47.6)	220 (48.2)	13 (38.2)			
25'000 – 50'000	92 (18.8)	86 (18.9)	6 (17.6)			
> 50'000	165 (33.7)	150 (32.9)	15 (44.1)			
Due to CV19 Pandemic[†]						
Status Loss	72 (14.7)	67 (14.7)	5 (14.7)	0 (1)	1	
Financial problems	100 (20.4)	92 (20.2)	8 (23.5)	0.06 (1)	.804	
Job insecurity	112 (22.9)	102 (22.4)	10 (29.4)	0.54 (1)	.464	
Job loss	41 (8.4)	37 (8.1)	4 (11.8)	0.18 (1)	.674	
Registration with the employment center (RAV)	34 (6.9)	30 (6.6)	4 (11.8)	0.64 (1)	.425	
Existential threat	95 (19.4)	86 (18.9)	9 (26.5)	0.74 (1)	.391	
Psychological Disorder[†]	117 (23.9)	112 (24.6)	5 (14.7)	1.19 (1)	.275	
Psychotherapy[†]	95 (19.4)	92 (20.2)	3 (8.8)	1.93 (1)	.164	
Psychiatric Medication[†]	64 (13.1)	62 (13.6)	2 (5.9)	1.05 (1)	.306	
Depression Cutoff						
PHQ-9 (≥ 10)	322 (65.7)	305 (66.9)	17 (50.0)	3.29 (1)	.070	
MDRS-22 (≥ 51)	67 (13.7)	58 (12.7)	9 (26.5)	3.07 (1)	.046*	
PHQ-9^a	12.6 (6.6)	12.7 (6.6)	11.3 (6.3)	1.21 (488)	.225	
MDRS-22^b	29.2 (20.6)	28.8 (20.3)	34.1 (24.4)	-1.45 (488)	.148	
BSRI (m)^c	62.5 (14.6)	62.2 (14.6)	65.4 (15.2)	-1.20 (488)	.116	
MRNI^d	45.6 (21.4)	44.9 (20.7)	54.4 (28.9)	-1.87 (35.6)	.035*	
GRCS^e	47.0 (12.6)	46.7 (12.2)	51.7 (16.0)	-1.78 (35.9)	.042*	
FCV-19S^f	12.8 (4.9)	12.9 (4.90)	11.8 (4.60)	1.28 (488)	.200	
CPSS^g	23.9 (5.2)	24.0 (5.15)	22.6 (5.38)	1.52 (488)	.130	

Note. *N* = number of participants, *M* = mean, *SD* = standard deviation, test-statistic = *t*-value for continuous, χ^2 -value for categorical variables, *df* = degrees of freedom, *p* = *p*-value, *CV19* = COVID-19. Subjective social status was dichotomized using a median-split.

[†] Assessed in self-report

^a PHQ-9 = Patient Health Questionnaire – 9; ^b MDRS-22 = Male Depression Risk Scale – 22; ^c BSRI (m) = Bem Sex-Role Inventory (*m* = masculinity subscale); ^d MRNI = Male Role Norms Inventory; ^e GRCS = Gender Role Conflict Scale; ^f FCV-19S = Fear of COVID-19 Scale; ^g CPSS = COVID-19 Pandemic Stress Scale

* = $p < .05$

Table 2. *Correlation Matrix for Study Variables*

	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	
1. PHQ-9 ^a	12.6	6.6	–						
2. MDRS-22 ^b	29.2	20.6	.64***	–					
3. BSRI (m) ^c	62.5	14.6	-.36***	-.10	–				
4. MRNI ^d	45.6	21.4	-.06	.17**	.33***	–			
5. GRCS ^e	47.0	12.6	.41***	.48***	.01	.39***	–		
6. FCV-19S ^f	12.8	4.9	.29***	.28***	-.16**	-.15**	.18***	–	
7. CPSS ^g	23.9	5.2	.31***	.28***	.03	-.04	.24***	.58***	–

Note. *M* = mean, *SD* = standard deviation. *p*-values were adjusted for multiple testing using the Holm-Bonferroni method.

^a PHQ-9 = Patient Health Questionnaire – 9; ^b MDRS-22 = Male Depression Risk Scale – 22; ^c BSRI (m) = Bem Sex-Role Inventory (masculinity subscale); ^d MRNI = Male Role Norms Inventory; ^e GRCS = Gender Role Conflict Scale; ^f FCV-19S = Fear of COVID-19 Scale; ^g CPSS = COVID-19 Pandemic Stress Scale.

** = $p < .01$, *** = $p < .001$

Figure 1. Flow diagram of the inclusion and exclusion process

Note. N = number of participants

Figure 2. Mean Score Comparisons between Men with and without COVID-19 Infection and their two- and one-sided 95% Confidence Intervals.

Note. ^a PHQ-9 = Patient Health Questionnaire – 9; ^b MDRS-22 = Male Depression Risk Scale – 22; ^c BSRI (m) = Bem Sex-Role Inventory (masculinity subscale); ^d MRNI = Male Role Norms Inventory (subscales: NT = Negativity toward Sexual Minorities; RE = Restrictive Emotionality; SR = Self-reliance through Mechanical Skills; AF = Avoidance of Femininity; IS = Importance of Sex; D = Dominance; T = Toughness); ^e GRCS = Gender Role Conflict Scale (subscales: SPC = Success, Power, Competition; RE = Restrictive Emotionality; RABBM = Restrictive Affectionate Behavior Between Men; CBWFR = Conflicts Between Work and Leisure - Family Relations); ^f FCV-19S = Fear of COVID-19 Scale; ^g CPSS = COVID-19 Pandemic Stress Scale.

* = $p < .05$

Figure 3. *Standardized Odds Ratios for COVID-19 Infection and their two- and one-sided 95% Confidence Intervals.*

Note. OR = Odds ratio

^a PHQ-9 = Patient health Questionnaire – 9; ^b MDRS-22 = Male Depression Risk Scale – 22; ^c BSRI (m) = Bem Sex-Role Inventory (masculinity subscale); ^d MRNI = Male Role Norms Inventory (subscales: NT = Negativity toward Sexual Minorities; RE = Restrictive Emotionality; SR = Self-reliance through Mechanical Skills; AF = Avoidance of Femininity; IS = Importance of Sex; D = Dominance; T = Toughness; ^e GRCS = Gender Role Conflict Scale (subscales: SPC = Success, Power, Competition; RE = Restrictive Emotionality; RABBM = Restrictive Affectionate Behavior Between Men; CBWFR = Conflicts Between Work and Leisure - Family Relations); ^f FCV-19S = Fear of COVID-19 Scale; ^g CPSS = COVID-19 Pandemic Stress Scale.

* = $p < .05$

Figure 4. Differences in COVID-19 and Depression Symptoms, Fear of COVID-19, and COVID-19 Pandemic related Stress between men with low and high Traditional Masculinity.

Note. S. = symptoms, mal. = malaise, low/high = below/above the median.

^a PHQ-9 = Patient health Questionnaire – 9; ^b MDRS-22 = Male Depression Risk Scale – 22; (masculinity subscale); ^d MRNI = Male Role Norms Inventory; ^e GRCS = Gender Role Conflict Scale; ^f FCV-19S = Fear of COVID-19 Scale; ^g CPSS = COVID-19 Pandemic Stress Scale. * = $p < .05$

Examining the role of traditional masculinity and depression in men's risk for contracting COVID-19

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Supplementary Material

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S-Figure 1. *Standardized Odds Ratios for COVID-19 Infection and their two- and one-sided 95% Confidence Intervals*

Note. OR = Odds ratio

^a PHQ-9 = Patient health Questionnaire – 9; ^b MDRS-22 = Male Depression Risk Scale – 22; ^c BSRI (m) = Bem Sex-Role Inventory (masculinity subscale); ^d MRNI = Male Role Norms Inventory; ^e GRCS = Gender Role Conflict Scale ; ^f FCV-19S = Fear of COVID-19 Scale; ^g CPSS = COVID-19 Pandemic Stress Scale.

* = $p < .05$

S-Table 1. Results of Mean Score Comparisons between Men with and without COVID-19 Infection

Variable	No CV19	CV19	<i>t</i> (<i>df</i>)	<i>p</i>	<i>p</i> (corr.)	<i>d</i>
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)				
PHQ-9^a	12.7 (6.6)	11.3 (6.3)	1.21 (488)	.225	1	-.22
MDRS-22^b	28.8 (20.3)	34.1 (24.4)	-1.45 (488)	.148	1	.26
BSRI (m)^c	62.2 (14.6)	65.4 (15.2)	-1.20 (488)	.116	.668	.21
MRNI^d (tot.)	44.9 (20.7)	54.4 (28.9)	-1.87 (36)	.035*	.561	.44
(NT)	4.3 (3.1)	5.6 (4.8)	-1.61 (35)	.058	.643	.41
(RE)	6.7 (4.0)	8.3 (4.7)	-2.12 (488)	.017*	.308	.38
(SR)	10.5 (4.9)	11.6 (5.4)	-1.31 (488)	.095	.668	.23
(AF)	5.2 (3.7)	6.5 (5.7)	-1.27 (35)	.106	.668	.33
(IS)	4.7 (3.1)	5.7 (3.9)	-1.73 (488)	.042*	.624	.31
(D)	4.4 (2.9)	6.1 (5.0)	-1.94 (35)	.030*	.511	.55
(T)	9.1 (5.0)	10.6 (5.7)	-1.66 (488)	.049*	.624	.30
GRCS^e (tot.)	46.7 (12.2)	51.7 (16.0)	-1.78 (36)	.042*	.624	.40
(SPC)	13.1 (4.8)	14.9 (6.0)	-1.75 (36)	.044*	.624	.38
(RE)	12.5 (5.6)	13.9 (5.2)	-1.43 (488)	.076	.667	.26
(RABBM)	7.7 (3.7)	8.7 (5.0)	-1.12 (36)	.136	.668	.26
(CBWFR)	13.4 (5.2)	14.1 (6.3)	-0.80 (488)	.212	.668	.14
FCV-19S^f	12.9 (4.9)	11.8 (4.6)	1.28 (488)	.200	1	-.23
CPSS^g	24.0 (5.2)	22.6 (5.4)	1.52 (488)	.130	1	-.27

Note. One-sided *t*-tests were used for the BSRI (m), MRNI (including all its subscales), and GRCS (including all its subscales). *M* = mean score, *SD* = standard deviation, *t* = *t*-value, *df* = degrees of freedom, *p* = *p*-value, *corr.* = corrected for multiple testing using the Holm-Bonferroni method, *d* = Cohen's *d*.

^a PHQ-9 = Patient Health Questionnaire – 9; ^b MDRS-22 = Male Depression Risk Scale – 22; ^c BSRI (m) = Bem Sex-Role Inventory (masculinity subscale); ^d MRNI = Male Role Norms Inventory (subscales: NT = Negativity toward Sexual Minorities; RE = Restrictive Emotionality; SR = Self-reliance through Mechanical Skills; AF = Avoidance of Femininity; IS = Importance of Sex; D = Dominance; T = Toughness); ^e GRCS = Gender Role Conflict Scale (subscales: SPC = Success, Power, Competition; RE = Restrictive Emotionality; RABBM = Restrictive Affectionate Behavior Between Men; CBWFR = Conflicts Between Work and Leisure - Family Relations); ^f FCV-19S = Fear of COVID-19 Scale; ^g CPSS = COVID-19 Pandemic Stress Scale.

* = *p* < .05

S-Table 2. Results of Binary Logistic Regression Analyses predicting COVID-19 Infection using Total Scores

Variable	β^1 (<i>SE</i>) ¹	OR ¹	95% CI	<i>p</i>	<i>p</i> (<i>corr.</i>)
Intercept	-2.94 (0.23)	0.05	[0.03, 0.08]	< .001***	< .001***
PHQ-9^a	-0.63 (0.29)	0.53	[0.30, 0.93]	.031*	.338
MDRS-22^b	0.51 (0.24)	1.66	[1.04, 2.65]	.032*	.338
BSRI (m)^c	-0.03 (0.22)	0.97	[0.69, ____]	.395	1
MRNI^d	0.12 (0.20)	1.12	[0.80, ____]	.451	1
GRCS^e	0.38 (0.24)	1.46	[0.98, ____]	.285	.479
FCV-19S^f	-0.19 (0.25)	0.83	[0.49, 1.34]	.460	1
CPSS^g	-0.21 (0.24)	0.81	[0.50, 1.29]	.369	1
Covariates					
Age	-0.21 (0.21)	0.81	[0.51, 1.18]	.318	1
Income	-0.04 (0.21)	0.96	[0.46, 1.25]	.860	1
Education	0.61 (0.28)	1.84	[1.12, 3.40]	.031*	.338
Sexual Orientation	0.01 (0.22)	1.01	[0.63, 1.50]	.944	1
Goodness of Fit					
Information criteria	AIC = 247.3; BIC = 297.7; R^2 = 11.9 %				
Likelihood-ratio test	χ^2 = 23.7; <i>df</i> = 11; <i>p</i> = .015 *				

Note. ¹ Coefficients z-standardized. One-sided z-tests were used for the BSRI (m), MRNI (including all its subscales), and GRCS (including all its subscales). β = estimate, *SE* = standard error, *CI* = confidence interval, *p* = *p*-value, *corr.* = corrected for multiple testing using the Holm-Bonferroni method, R^2 = Nagelkerke pseudo *R*-squared.

^a PHQ-9 = Patient Health Questionnaire – 9; ^b MDRS-22 = Male Depression Risk Scale – 22; ^c BSRI (m) = Bem Sex-Role Inventory (masculinity subscale); ^d MRNI = Male Role Norms Inventory; ^e GRCS = Gender Role Conflict Scale; ^f FCV-19S = Fear of COVID-19 Scale; ^g CPSS = COVID-19 Pandemic Stress Scale.

* = *p* < .05, *** = *p* < .001

S-Table 3. Results of Binary Logistic Regression Analyses predicting COVID-19 Infection using Subscales

Variable	β^1 (<i>SE</i>) ¹	OR ¹	95% CI	<i>p</i>	<i>p</i> (<i>corr.</i>)
Intercept	-2.99 (0.24)	0.05	[0.03, 0.08]	< .001***	< .001***
PHQ-9^a	-0.75 (0.31)	0.47	[0.25, 0.85]	.015*	.299
MDRS-22^b	0.50 (0.24)	1.64	[1.01, 2.66]	.043*	.766
BSRI (m)^c	-0.06 (0.23)	0.94	[0.64, ____]	.395	1
MRNI^d subscales					
(NT)	0.16 (0.23)	1.17	[0.79, ____]	.245	1
(RE)	0.02 (0.29)	1.02	[0.63, ____]	.471	1
(SR)	0.07 (0.26)	1.08	[0.69, ____]	.390	1
(AF)	-0.36 (0.29)	0.70	[0.43, ____]	.106	1
(IS)	0.01 (0.24)	1.01	[0.66, ____]	.478	1
(D)	0.38 (0.27)	1.46	[0.93, ____]	.081	1
(T)	-0.12 (0.32)	0.88	[0.52, ____]	.350	1
GRCS^e subscales					
(SPC)	0.18 (0.23)	1.20	[0.82, ____]	.214	1
(RE)	0.32 (0.23)	1.38	[0.95, ____]	.078	1
(RABBM)	-0.04 (0.23)	0.96	[0.65, ____]	.421	1
(CBWFR)	0.20 (0.22)	1.22	[0.85, ____]	.179	1
FCV-19S^f	-0.23 (0.26)	0.80	[0.46, 1.32]	.393	1
CPSS^g	-0.15 (0.25)	0.86	[0.52, 1.40]	.535	1
Covariates					
Age	-0.23 (0.23)	0.80	[0.48, 1.22]	.327	1
SES	-0.04 (0.18)	0.96	[0.49, 1.23]	.819	1
Education	0.62 (0.29)	1.86	[1.11, 3.51]	.034*	.647
Sexual Orientation	-0.01 (0.22)	0.99	[0.61, 1.49]	.977	1
Goodness of Fit					
Information criteria	AIC = 261.2; BIC = 349.3; R^2 = 13.9 %				
Likelihood-ratio test	χ^2 = 27.8; <i>df</i> = 20; <i>p</i> = .114				

Note. ¹ Coefficients *z*-standardized. One-sided *z*-tests were used for the BSRI (m), MRNI (including all its subscales), and GRCS (including all its subscales). β = estimate, *SE* = standard error, *CI* = confidence interval, *p* = *p*-value, *corr.* = corrected for multiple testing using the Holm-Bonferroni method, R^2 = Nagelkerke pseudo *R*-squared.

^a PHQ-9 = Patient Health Questionnaire – 9; ^b MDRS-22 = Male Depression Risk Scale – 22; ^c BSRI (m) = Bem Sex-Role Inventory (masculinity subscale); ^d MRNI = Male Role Norms Inventory (subscales: NT = Negativity toward Sexual Minorities; RE = Restrictive Emotionality; SR = Self-reliance through Mechanical Skills; AF = Avoidance of Femininity; IS = Importance of Sex; D = Dominance; T = Toughness); ^e GRCS = Gender Role Conflict Scale (subscales: SPC = Success, Power, Competition; RE = Restrictive Emotionality; RABBM = Restrictive Affectionate Behavior Between Men; CBWFR = Conflicts Between Work and Leisure - Family Relations); ^f FCV-19S = Fear of COVID-19 Scale; ^g CPSS = COVID-19 Pandemic Stress Scale.

* = *p* < .05

S-Discussion: Discussion part on traditional masculinity and specific COVID-19-related symptoms

Possible group differences between men with high and low traditional masculinity regarding expression of COVID-19 symptoms in men who contracted COVID-19 were investigated. However, the exploratory analysis included only a subsample of 34 men reporting to have contracted COVID-19. As can be seen in Figure 4A, men with high traditional masculinity operationalized as high BSRI scores exhibited less general (i.e. pain symptoms, headache, joint pain, muscle pain, peripheral neuropathy) pain symptomatology (47.4%) as compared to men with low traditional masculinity (80.0%) and lower PHQ-9 scores as compared to men with low traditional masculinity. This is line with previous research showing studies using the BSRI-M to report higher masculine gender orientation to be positively associated with constructs such as self-esteem and self-confidence and negatively associated with depression and anxiety symptoms (Johnson & McCoy, 2000; Long, 1986; O'Heron & Orlofsky, 1990). Nevertheless, although non-significant due to the very small sample size, a clear picture is observable, that in general men with higher BSRI-M scores report overall less COVID-19 symptomatology. With regard to the MRNI-SF and the GRCS-SF this is not the case suggesting the masculinity measures based on the gender role strain paradigm in contrast to the gender role identity paradigm (BSRI-M) reveal more complex associations and suggest to examine specific subscales in order to identify, which specific role norms or gender role conflicts are related to symptom expression.