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Restrictive measures and course of behavioral outcomes in representative adult Greek population during the COVID-19 pandemic: Results on functioning, coping, alcohol/substance abuse, smoking, gambling, pro-social activities and domestic violence from the largest multi-wave COVID-19 online national survey in Greece (COH-FIT)

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Original Article

Restrictive measures and course of behavioral outcomes in representative adult Greek population during the COVID-19 pandemic: Results on functioning, coping, alcohol/substance abuse, smoking, gambling, pro-social activities and domestic violence from the largest multi-wave COVID-19 online national survey in Greece (COH-FIT)

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ABSTRACT

Background: Greece encountered unique COVID-19-pandemic-related challenges, shaped by the country's previous deleterious economic context, an already strained healthcare system and possibly one of Europe's earliest, longest and most stringent restrictive protocols. **Objectives:** To offer comprehensive insights into the longitudinal trajectory of a broad range of behavioral and coping parameters within general adult Greek population across the first two pandemic waves. **Methods:** Multiple-wave, cross-sectional data from the "Collaborative Outcomes study on Health and Functioning during Infection Times" (COH-FIT) assessed four different time points in order to examine outcomes changes from retrospective, pre-pandemic baseline ratings (T0) to three distinct intra-pandemic time points (lockdown 1: T1, between lockdowns: T2, lockdown 2: T3). Outcomes included functioning, subjective resilience, tobacco/alcohol/cannabis/substance consumption, gambling, domestic violence, time spent in different activities, importance of coping strategies and prosocial activity. **Results:** We overall evaluated 10,377 participant responses, including 2,737 representative-matched participants across T1-T3 (T1: 3,940/887, T2: 4,675/997, T3: 1,668/853 convenience/representative-matched participants). All subjects provided retrospective rating on T0. Results suggest a highly significant pre- to intra-pandemic (T0 vs. T1-T3) drop in functioning and resilience scores. Tobacco, alcohol and cannabis consumption increased from pre- to intra-pandemic each at different pandemic phases. Gambling scores were overall very low and decreased from pre- to all intra-pandemic time-points. Domestic violence showed only an early transient increase (T1), returning to pre-pandemic levels. Individuals spent significantly more hours in social media, internet, gaming, TV, reading, music intra- than pre-pandemic, with the exception of exercise. Highest-rated coping strategies were exercise/walking, internet use, meaningful hobby, social media use and studying/learning. Most results showed notable changes across the assessed intra-pandemic time frames (T1, T2, and T3) normally with lockdowns negatively affecting behavioral and coping strategies (e.g., lower functioning/resilience scores in lockdown T1 and T3 than in T2), suggesting a substantial effect of quarantine lockdown status on many behavioral parameters. **Conclusions:** This is the most extensive multi-wave report on behavioral responses and coping mechanisms across

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pandemic restriction phases in Greece and can inform national policy towards the enhancement of healthy coping and resilience in similar future conditions.

Keywords: COVID-19; pandemic; Greece; representative; violence; coping; functioning, smoking, substance abuse, alcohol abuse.

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INTRODUCTION

In late 2019, the COVID-19 pandemic has led the planet to the uncharted waters of an enormous and rapid evolving global health crisis exceeding geographical and socioeconomic boundaries and demanding radical policies to mitigate its impact [1, 2]. Apart from its death toll, the pandemic posed vast challenges to and profound and unprecedented disruption of all personal life aspects, with far-reaching consequences for individuals, societies and economies [3, 4]. The applied restrictive policies introduced compulsory and radical life-style changes alongside with curtailed stress management options, thus likely enhancing unhealthy habits and negative coping strategies, challenging individual resilience [5, 6]. This seismic shift in personal routines, freedoms and challenges severely affected functioning, coping mechanisms and resilience [7], while mental health access and support was severely limited [8]. These challenges have led to repeatedly reported heightened levels of anxiety, depression, stress and trauma among diverse populations [6, 9], as well as several other systemic negative consequences (e.g., mental health service coverage, substance abuse, domestic violence, socio-economic disparities/inequalities), particularly affecting vulnerable population groups [8, 10, 11].

In Greece, the COVID-19 pandemic presented unique challenges, intersecting with the country's previous deleterious economic context, an already strained healthcare system [12] and possibly one of Europe's earliest, longest and most stringent restrictive protocols (University of Oxford stringency metric, https://covidtracker.bsg.ox.ac.uk/), with profound socio-economic ramifications [13]. Studies conducted during the early phases of the pandemic have highlighted elevated levels of anxiety, depression, and stress among the general Greek population, underscoring the need for sustained monitoring and intervention efforts [14-16]. However, most studies have reported single-time, cross-sectional data on small, non-representative samples or specific population target groups, assessing a very restricted sets of outcomes, without detailed demographic data or behavioral parameters. For example, only few studies included over 2,000 participants [14-16], while the largest study reporting on suicidality included a convenience sample of 5,748 participants [17]. In addition, the few general population studies in Greece [16, 18, 19] did not assess behavioral parameters or coping strategies. There were only few international studies reporting

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original and internationally comparable mental health data during the COVID-19 pandemic in Greece (Fountoulakis et al., 2022; Long et al., 2022). These studies, however, also included only small samples in a cross-sectional design. Besides one study reporting cross-sectional, convenience-sample results from both the first and the second lockdown (Gournellis & Efstathiou, 2021), and a small international study in five countries (Long et al., 2022), no study yet has reported multi-wave/longitudinal data. Taken together, no study to date has yet reported original large-scale, multi-faceted, internationally comparable data on behavioral/coping parameters in the general Greek population sample across different pandemic time-points, thus precluding a comprehensive understanding of the population's coping responses to the pandemic over time.

However, the dynamic nature of the pandemic necessitates a longitudinal approach (i.e., according to wave-adapting restrictive measures) to better capture the evolving psychological landscape and identify potential trajectories of adaptation and risk factors over time [5, 20]. Investigating the trajectory of psychological well-being and coping mechanisms amid the duration of the pandemic across nations is paramount for elucidating patterns of resilience and vulnerability, adaptive responses and identifying risk factors for psychological distress/resilience, functioning and behavioral coping [20]. In addition, given that most pandemic-related studies do not meet the minimum scientific criteria for quality and rigorous methodology, more high-quality research is needed in order to advance, rather than mislead, the field [21].

Leveraging data from the "Collaborative Outcomes study on Health and Functioning during Infection Times" (COH-FIT), the potentially largest international, multilanguage online longitudinal study worldwide measuring the impact of COVID-19 pandemic on health and functioning in general population around the globe over a period of 2 years [22, 23], this study aims to provide comprehensive insights through high-quality, comparable data and rigorous methodology into the longitudinal course of behavioral and coping parameters amidst the evolving pandemic landscape in Greece.

In particular, the overarching objective of this study is to investigate in detail and for the first time the presence and ongoing changes of parameters of overall functioning, coping strategies, pro-social activities, alcohol/substance abuse, smoking, gambling and domestic violence in response to

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pandemic-related restrictive measures among Greek adults before and during the first two waves of the COVID-19 pandemic, in order to better understand of the multifaceted interplay between restrictive measures, pandemic-related experiences, sociodemographic factors, and behavioral outcomes over time in Greece. We hypothesize that several behavioral and coping aspects will be heavily affected by the pandemic, with a particular burden in times of stricter pandemic measures. First results of the COH-FIT study have indicated a particularly negative impact of the pandemic in Greece in international comparison, suggesting the 4th worst decline in mental health and well-being in Europe and 14th worldwide) [9].

MATERIALS & METHODS

This article presents a multi-wave, cross-sectional quantitative analysis of retrospective (pre-pandemic) and current (intra-pandemic) COH-FIT data from representative-matched and non-representative adult Greek general population on functioning and coping behaviors over a period of 12 months and across two general strict lockdown and one between-lockdown periods (**Figure 1**). Our primary outcomes were pre- vs. intra-pandemic scores and their changes in functioning (overall, family, household, self-care, social and work functioning) and resilience, individual coping strategies (exercise, gaming, internet use, social media use, etc.), substance abuse (tobacco, alcohol, cannabis, other substances), gambling, and rates of witnessed or experienced domestic violence.

Study Design, Questionnaire & Participants

The design of COH-FIT has been described and discussed in detail previously [22-24]. Briefly, COH-FIT assessed current and recalled aspects of both physical and mental health/functioning as the utilization of several coping behaviors, in order to measure the impact of the pandemic in populations across the globe (**Suppl. Methods**). Data collection occurred continuously, allowing for longitudinal analysis of changes in outcomes and responses over time at the population level. Since April 27th, 2020 COH-FIT has collected over 150,000 responses from adults in over 150 countries. The COH-FIT questionnaire comprises of >400 questions collecting a wide range of information. Detailed information on the COH-FIT questionnaire development and structure, is provided in prior

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publications [22-24] and **Suppl. Methods**. Outcome questions were asked for the time period of “2 weeks of normal life prior to the outbreak of the COVID-19 pandemic” and for the “last two weeks prior to taking the survey”. We chose the two-week time periods as reasonable time frames assuring stability and validity of responses and also to be consistent with the National Institute of Mental Health “CoRonavIruS Health Impact Survey” (CRISIS) [25]. Continuous ratings in different items are based on subjective, self-rated answers through a visual analogue scale (VAS, 0-100) or number/frequency indication in certain time window.

Setting, Participants and Recruitment

For inclusion, participants had to be Greece residents, aged ≥18 years, providing informed consent for study participation, conducted online via the COH-FIT website (www.coh-fit.com). Two main recruitment strategies were applied. The first snowball approach generated a non-probability, convenience sample aiming to maximize the overall number of collected responses and the representation of diverse demographic groups through several channels of targeted and untargeted, personal and institutional advertisement (e.g., social media, mass media, personal network, online communities, press releases, institutional newsletters). The second approach targeted nationally representative samples (with respect to sex, age, area population size), by a paid professional polling company (PRORATA S.A.) collecting COH-FIT survey responses in Greece on behalf of the project members from May 22nd until June 11th, 2020.

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Statistical Analyses

- *Time periods:* Our analysis covered three time periods (**Figure 1**): a) T1: from the inception of the study (April 27th, 2020, which lies within the period of the first general strict Greek lockdown) until the end of the first general strict Greek lockdown (May 5th, 2020); b) T2: from the end of the first general strict Greek lockdown (May 5th, 2020) until the start of the second general strict Greek lockdown (November 4th, 2020) and T3: from the beginning of the second general strict Greek lockdown (November 4th, 2020) until the end of the second general strict Greek lockdown (May 4th, 2021). As T0, we refer to the answers provided by study participants with respect to the retrospective

assessment of every outcome measure "2 weeks of normal life prior to the outbreak of the COVID-19 pandemic" (Figure S1).

- *Matching:* The total sample before matching includes both samples (non-probability/convenience and representative) and resulting in a non-random and non-representative sample with several characteristics of the population over/underrepresented. We did not use the data from the representative sample independently, due to a very brief collection time interval (20 days only within T2) that does not reflect a longitudinal spread of the psychological pandemic effects. Instead, we used propensity score matching (PSM) [26] to match the participants of the representative sample to participants of the non-representative sample in each of the three periods (T1, T2, T3) separately. In this approach, we considered following categorical confounders: gender (male/female), living area population size (0-10,000, 10,001-100,000, 100,001-500,000, 500,001+ inhabitants), and age group (18-34, 35-54, 55+ years of age) and used the nearest neighbor matching algorithm using logit as the distance measure, without replacement, and implemented a caliper of 0.2 (a constant which constrains the difference between the propensity scores of the two samples). We conducted two types of analyses separately: one based on the total sample, and one based on the matched sample.

- *Data handling/screening and missing data:* Prior to the main analyses, initial data were screened through computation of minimum and maximum values for each variable to identify out-of-range values, leading to their exclusion or truncation. For the available/remaining data, we conducted a Complete Case Analysis (CCA) due to substantial missingness, sometimes exceeding 40% in items positioned towards the end of the questionnaire. This hinders any imputation method and is probably due to tiredness and lack of interest from the respondents, an assumption that is compatible with Missing Completely at Random (MCAR), under which CCA yields unbiased estimates [27].

- *Statistical analyses:* For quantitative variables, we used descriptive statistics such as mean (standard deviations, SD) and median values (min-max, quartiles: Q1 25%, Q3 75%), while for qualitative variables we used frequencies and percentages (%). We used ANOVA and *t*-tests to determine whether there were statistically significant differences between time periods. For ANOVA, the false discovery rate (FDR) was used for correction of type I errors when conducting multiple

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comparisons. For assessing non-parametric measures across time, Kruskal-Wallis test has been employed. Significance level was set at 0.05. Finally, we present graphically how longitudinal outcomes of interest changed over time. Matched sample was produced in R using the package MatchIt [28]. Total functioning has been calculated as the mean of the six different functioning modalities to each time point.

RESULTS

From a total of 10,377 participants identified during the study period, 94 subjects were excluded due to minor age (<18), resulting in a total of 10,283 participants. This sample included two subsamples: a) a representative sample of the Greek population of 977 participants collected in T2 which was used for matching/weighting of the sample, and b) a non-probability, convenience sample of 9,286 participants collected over T1, T2 and T3. We present results for both the total and the matched/weighted sample (based on the representative sample) for each time period separately.

The questionnaire was answered by 3,928 participants during the first lockdown (T1), 4,668 in the period between the two national lockdowns (T2), and 1,661 during the in second lockdown (T3). Matching participants to the representative sample resulted in 997 nationally representative matched participants during T1, 887 during T2, and 853 during T3. Demographics and the descriptives of non-modifiable factors across the three periods are presented in detail in **Table 1**. Overall, the vast majority of participants were white/Caucasian of middle socioeconomic status, having at least a high school degree and living with family members in mid/large size cities. About half of the participants reported having a co-living partner or being married. Mean age was slightly above 40 y.o.a. and slightly more than 50% were employed. Missingness data are reported separately for each question in the Tables.

Functioning

Generically generated overall functioning scores (VAS 0-100) were statistical significantly lower in all three intra-pandemic periods (T1, T2, T3) in comparison to pre-pandemic T0 scores for both samples (**Table S1, Figure 2**) and showed statistically significant chances across time (T1 vs. T2

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vs. T3) in both samples with a significant increase from T1 to T2 and a statistically significant decrease at T3 in comparison to both T1 and T2. Detailed individual functioning scores are provided in the **Suppl. Results** section and in **Tables S2 & S3, Figure S1**.

Resilience

Subjective resilience scores (VAS 0-100) were statistical significantly lower in all three intra-pandemic periods (T1, T2, T3) in comparison to pre-pandemic T0 scores for both samples and showed statistically significant chances across time in both samples with a statistically significant increase from T1 to T2 in the total, but not in the matched sample, and a statistically significant decrease at T3 in comparison to T1 and T2 in both samples (**Table S4, Figure S2**).

Tobacco, alcohol, cannabis and substance abuse

Tobacco consumption scores (cigarettes per day) in all three intra-pandemic periods (T1, T2, T3) were statistical significantly higher than at T0 for both samples (**Tables S5 & S6, Figure 3**) and showed statistically significant chances across time in both samples, with no differences from T1 to T2, but a statistically significant increase at T3 in comparison to T1 and T2 in both samples. Alcohol consumption scores (alcohol units per day) were statistical significantly higher in comparison to T0 for both samples at T1, but not at T2. At T3, alcohol consumption scores were statistical significantly lower than at T0 in the matched, but not in the total sample. Alcohol consumption scores showed statistically significant chances across time in the total but not in the matched sample, with a statistically significant decrease from T1 to T2, but not T3. Cannabis consumption scores (average grams per day in past 2 weeks) were overall very low, but statistical significantly higher than pre-pandemic scores at T3 in the matched sample and at T2 and T3 in the total sample. Cannabis consumption scores showed statistically significant chances across time in the total but not in the matched sample, with a statistically significant increase at T3 in comparison to both T1 and T2. Consumption scores for other substances (overall intakes in past 2 weeks) were also overall very low, but statistical significantly higher than pre-pandemic scores at T1 and T2, but not T3, in both samples. Consumption scores for other substances showed statistically significant chances across

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time in the total but not in the matched sample, with a statistically significant increase at T3 in comparison to T2, but not T1.

Gambling

Gambling scores (VAS 0-100: never-daily) were overall very low and statistical significantly lower in all three intra-pandemic periods (T1, T2, T3) than at T0 in both samples (**Table S7, Figure S3**) and showed statistically significant chances across time in both samples, with a statistically significant increase in the matched sample at T3 in comparison to both T1 and T2 and statistically significant increase in the total sample from T1 to both T2 and T3.

Domestic violence

Witnessing or experiencing (victim) domestic violence scores (violence episodes in the past 2 weeks) were overall very low (**Table S8**). Witnessing domestic violence scores were, however, significantly higher at T1 and T2 (but not T3) in comparison to pre-pandemic scores for the total sample, while the matched sample showed only significantly higher scores in comparison to T0 at T1. In the total sample, witnessing domestic violence scores showed no statistically significant differences across time (**Figure S4, A-B**). In the matched sample, witnessing domestic violence scores showed statistically significant chances across time and T1 scores were significantly higher than T2 and T3, but there was no difference between T2 and T3. Being victim of domestic violence scores were significantly higher only at T1 in comparison to pre-pandemic scores in both the total and the matched sample. In both samples, experiencing domestic violence scores showed no statistically significant differences across time.

Time spent in different activities

Time spent (average hours per day in past 2 weeks) in social media, internet use, gaming and TV/other-screen-time in all three intra-pandemic periods (T1, T2, T3) were statistical significantly higher intra- than pre-pandemic for both samples (**Tables S9 & S10, Figure S5**). Reading time was statistical significantly higher intra- than pre-pandemic in the matched sample only. Music listening

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time was statistical significantly higher in comparison to T0 at T1 and T2, but not T3, in both samples. Exercise time (average minutes per day in past 2 weeks) did not differ significantly between T0 and both T1 and T2, but was statistical significantly lower at T3 in comparison to T0 in both samples. Sexual activity (incidents in past 2 weeks) was significantly lower at all three intra-pandemic timepoints in comparison to T0 in both groups (with the exception of T2 at the matched sample).

Time spent in social media, gaming, internet use, TV/other screening time, reading and exercise showed statistically significant chances across time in the total sample. In the matched sample, only social media use showed statistically significant chances across time with a significant decrease from T1 to T2 and a statistically significant increase at T3 in comparison to T2, but not T1, in both samples. Music-listening time showed no statistically significant chances across time in both samples. Gaming showed no differences between T1 and T2, but a significant increase at T3 in comparison to both T1 and T2 in the total sample. Reading showed a statistically significant increase from T1 to T2 and a statistically significant decrease at T3 in comparison to T2 and T1 in the total sample. Internet use in the total sample showed a statistically significant decrease from T1 to T2 and a statistically significant increase at T3 in comparison to T2, but not T1. TV/other-screen-time scores showed a statistically significant decrease from T1 to T2 and a statistically significant increase at T3 in comparison to T2, but not T1 in the total sample. Exercise scores in the total sample showed a statistically significant decrease from T1 to both T2 and T3, but no differences between T2 and T3. Sexual activity showed statistically significant chances across time in both samples. In the total sample sexual activity at T3 was lower in comparison to both T1 and T2 (but no difference between T1 and T2), while in the matched sample sexual activity at T2 was higher than at T3, while no other significant differences were apparent.

Importance of coping strategies

In the total sample, the 5 coping strategies highest rated as very important were exercise/walking (T1: 62.2%, T2: 63.6%, T3: 63.4%), internet use (T1: 62.8%, T2: 54.9%, T3: 54.6%), meaningful hobby (T1: 60.7%, T2: 60.7%, T3: 62.3%), social media use (T1: 50.3%, T2: 40.4%, T3: 40.5%) and studying/learning (T1: 47.3%, T2: 49.6%, T3: 49.1%), followed by work, media use, getting COVID-

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19 information, sexual activity and spending time with a pet (**Figure 4, A-C**). On the other hand, the 4 coping strategies lowest rated as very important were substance use (T1: 8.6%, T2: 5.9%, T3: 9.1%), prescribed medications (T1: 10.1%, T2: 12.6%, T3: 13.5%), gaming (T1: 11.0%, T2: 12.3%, T3: 14.1%) and religiousness (T1: 14.7%, T2: 19.1%, T3: 18.0%). Very similar results have been also found in the matched sample (**Figure 4, A-C**). Changes across time for every coping strategy separately have been assessed by Kruskal-Wallis tests and are presented in **Table S10**.

Prosocial activities

Prosocial activities scores (number of activities in the past 2 weeks, e.g., giving food/clothing/money to people in need) were statistical significantly lower in comparison to T0 at T1 in the total, but not in the matched sample, and in T2 and T3 in both samples. Prosocial activities scores showed statistically significant chances across time only in the total sample, with a statistically significant increase from T1 to T2, but no changes between T1 and T2 to T3 (**Table S11, Figure S6**).

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DISCUSSION

The present study aimed to explore for the first time the ongoing impact of pandemic-related restrictive measures on the course of various behavioral parameters and coping strategies within general adult Greek population through such an elaborated methodology and large study sample. Utilizing data from the largest online COVID-19 survey worldwide (COH-FIT), this study offers a broad spectrum of novel, multi-wave, large-scale and representative data, that has never been assessed or reported before in Greece. In particular, our study investigated behavioral parameters of major importance that were rarely addressed in previous studies such as overall functioning, different coping strategies, pro-social activity, alcohol/substance abuse, smoking, gambling and domestic violence in response to pandemic-related restrictive measures among Greek adults before and during the first two waves of the COVID-19 pandemic.

Our findings consistently showed a) mostly statistically highly significant differences between pre- and intra-pandemic scores (T0 vs. T1-T3) of all individual areas of functioning and resilience, with lower scores intra- vs pre-pandemic as evidenced by p-values consistently below 0.01 across

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multiple parameters, while household functioning was the only exception that showed higher scores intra- vs. pre-pandemic , b) alcohol and cannabis consumption showed a somewhat inverse course, with a higher intra-pandemic alcohol consumption only at T1 and a trend towards normalization at T2 and even lower rates than pre-pandemic at T3, while cannabis remained at pre-pandemic level at T1 and showed a later increase at T2 and T3, c) smoking rates were significantly higher intra- vs. pre-pandemic, d) gambling rates were significantly lower intra- vs. pre-pandemic e) domestic violence rates were higher only at the early stages of the pandemic (T1, T2) compared to pre-pandemic, f) individuals spent more hours in social media, internet, gaming, TV, reading, music intra- than pre-pandemic, while exercise time was not that affected, g) the 5 highest rated coping strategies were exercise/walking, internet use, meaningful hobby, social media use and studying/learning and h) witnessed or experienced domestic violence rates were overall low, but showed a transient significant increase at the beginning of the pandemic.

In addition, our results showed notable changes across the assessed intra-pandemic time frames (T1, T2, and T3), suggesting a substantial effect of quarantine lockdown status on specific behavioral parameters. All individual areas of functioning and resilience showed a significant increase from T1 to T2 and a subsequent decrease at T3 in comparison to both T1 and T2 with only few exceptions. With the exception of alcohol, gambling, cannabis, tobacco and substance abuse showed higher scores towards T3. Domestic violence did not show any intra-pandemic time differences, while time spent in specific activities showed mixed results across pandemic waves.

Overall, our study underscores the profound negative impact of the COVID-19 pandemic on behavioral parameters and coping strategies of the adult Greek population, showing a significant negative course of most behavioral outcomes over time, with only a temporary improvement mid-pandemic, followed by a subsequent new decline at T3. Previous general population studies in Greece [16, 18, 19] did not assess functioning, coping and resilience at all, while only related findings of small studies in specific occupational groups have been reported [29-31]. With respect to alcohol/substance abuse, only few studies reporting on convenience samples could be found [32-35], while only one study assessed smoking habits among general population, showing no differences between pre- and intra-pandemic smoking habits [36]. Studies on domestic violence

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were even more limited [37, 38], and there was no study found based on personal ratings, nor was a study found on gambling habits. Being the largest general population COVID-19-related study in Greece to date, covering our sample level with representative-matched samples and broad population demographics and collecting multi-wave behavioral data across 12 months accounting for changes in restrictive measures, our results are unique for Greece and adequately powered to detect changes in outcomes across time and enhance the comprehensive understanding of behavioral and coping responses to the pandemic over time.

An international comparison of our results is difficult due to differences in local COVID-19 exposure, pandemic timing and restrictive measures, as well as different local policies. Our main results on functioning, however, are in line with the global COH-FIT report with respect to the first pandemic year, as well as with the higher rated coping mechanisms. Interestingly, our findings suggesting higher intra-to pre-pandemic consumption of tobacco in the general Greek population, are not coherent with international reports suggesting the opposite observation [39]. This may be due to Greece's extremely high population smoking percentages according to Eurostat (https://ec.europa.eu/eurostat/databrowser/view/hlth_ehis_sk1c/default/table?lang=en). With respect to our findings concerning cannabis and alcohol consumption, systematic reviews of international studies have similarly suggested a relatively stable course in cannabis consumption, with differences mainly according to user status (frequent, non-frequent) [40], and an only transient increase in alcohol consumption [41]. Our study also showed an overall intra-pandemic decrease in gambling. This is only partly in line with international findings that suggest a reduced land-based gambling and sports betting, but a significantly increasing online gambling [42]. Finally, our findings on domestic violence suggesting a significant but transient increase, are coherent with international studies reporting an overall increase in domestic violence but with significant inter-country variation [43].

However, some limitations merit discussion. Most importantly, being a descriptive article, our paper did not analyze the effect of distinct psychopathology or mental/physical health and non-modifiable risk factors (socioeconomic, public health and demographic parameters) on our results, which remains to be addressed in further analyses. Additional limitations include the cross-sectional

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design at the individual level paired with retrospective recall to allow for calculation of pre- to intra-pandemic status. Finally, digital barriers precluded a larger participation from larger strata of the population, and more data are needed from subjects older than 65 years old.

CONCLUSIONS

International pandemic-related studies are very important for global comparisons, but it is local data that truly shapes national policies. This research presents the most comprehensive and detailed longitudinal analysis of behavioral parameters and coping strategies in Greece, spanning multiple time-points and COVID-19 restrictions periods, offering valuable, time-sensitive insights into the changing behavior and coping of the population. Understanding country-specific behavioral adaptation trends during the pandemic is imperative for informing evidence-based interventions and local policies to promote healthy coping in the aftermath of the pandemic and develop preventive ones for the future, tailored to the needs of the Greek population.

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ACKNOWLEDGEMENTS

Funding Statement

All institutions and funding agencies of the COH-FIT project have been previously published elsewhere [22]. For Greece only, additional funding for advertisement has been acquired through personal funds of AA and KT.

Conflict of Interest Statement

Conflict of interest statements of all authors have been previously published elsewhere [9].

Author Contributions Statement

CUC and MS are the principal investigators of the international COH-FIT project and wrote the initial study protocol. AA is coordinating co-investigator of the international COH-FIT project. AA, ED, KT and VPB are Greek national coordinators and responsible for study dissemination and data collection in Greece, as well as for designing and preparing research reports on Greek national data. AA, ED and KT contributed to and approved translations of the COH-FIT survey in Greek language. AA and VPB have applied and received ethical approval from the Institutional Review Board (IRB) at Aristotle University of Thessaloniki, Greece, on behalf of all national coordinators. AA, ED, DM, KT and VPB designed the statistical analysis plan, approved by CUC and MS. CUC, MS, AA, ED, DM, KT, TT, CC, CS, KMK, ST, OK, VPB had access to the raw Greek data. CC, ED, DM, KT, TT, CS, KMK, ST, OK wrote the codes and executed all statistical analyses. AA wrote the first draft. All authors read, contributed to and approved the final version of the manuscript.

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TABLES & FIGURES

Figure 1. Illustrative description of the different time periods of the study (T0, T1-3) along with participant's N, the respective COVID-19 morbidity and mortality, as well as and the national stringency index of restrictive measures per time period.

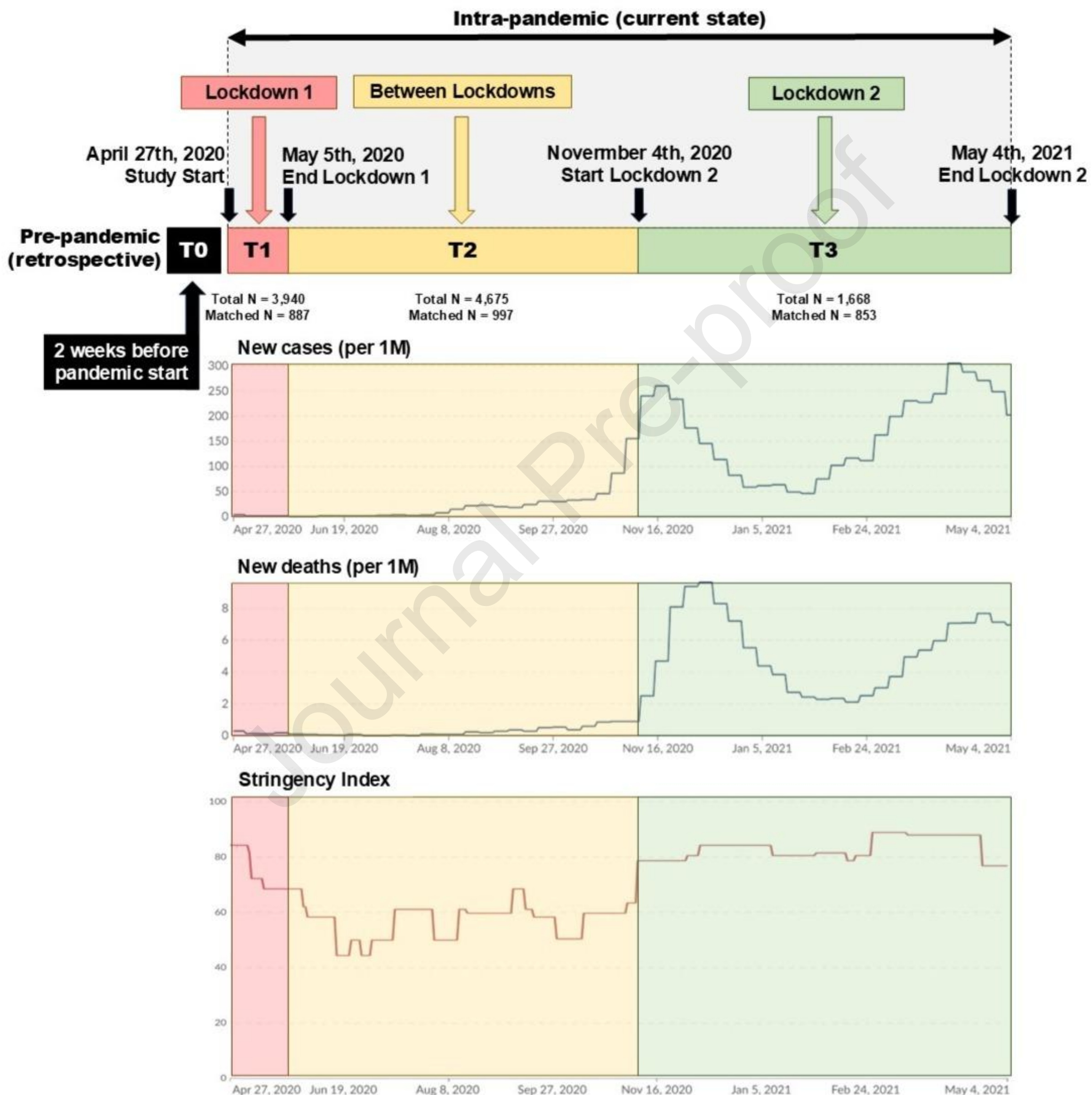

Figure Legend:

COVID-19 mordbidity, mortality and stringency index datasets included in this figure are provided at the publicly available at the free accessible domain of "Our World in Data" (www.ourworldindata.org) scientifically led by the University of Oxford, which provides aggregated and processed population data based on original official WHO data ("COVID-19 Dashboard WHO COVID-19 Dashboard - Daily cases and deaths") and other official sources. Data figures are also generated and provided by the Our World in Data website algorithm.

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Table 1. Descriptives of demographics and non-modifiable factors across T1, T2 and T3 in the total and matched sample.

==

For Table 1, we kindly refer to the separate document

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Table legend:

Definition of urbanicity: small town: 10,000-100,000 population, medium-size town: 100,000-500,000 population, large city: over 500,000 population). Statistics are reported as valid number of answers (percentage, %), numbers (mean/sd, median/Q1,Q3) and visual analog scale (VAS) scores (mean/sd, median/Q1,Q3). % is referred to valid answers only, missing % is referred to the total number of participants.

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Figure 2. Current and retrospective ratings (VAS 0-100) of total functioning and their differences across time (T1-T3).

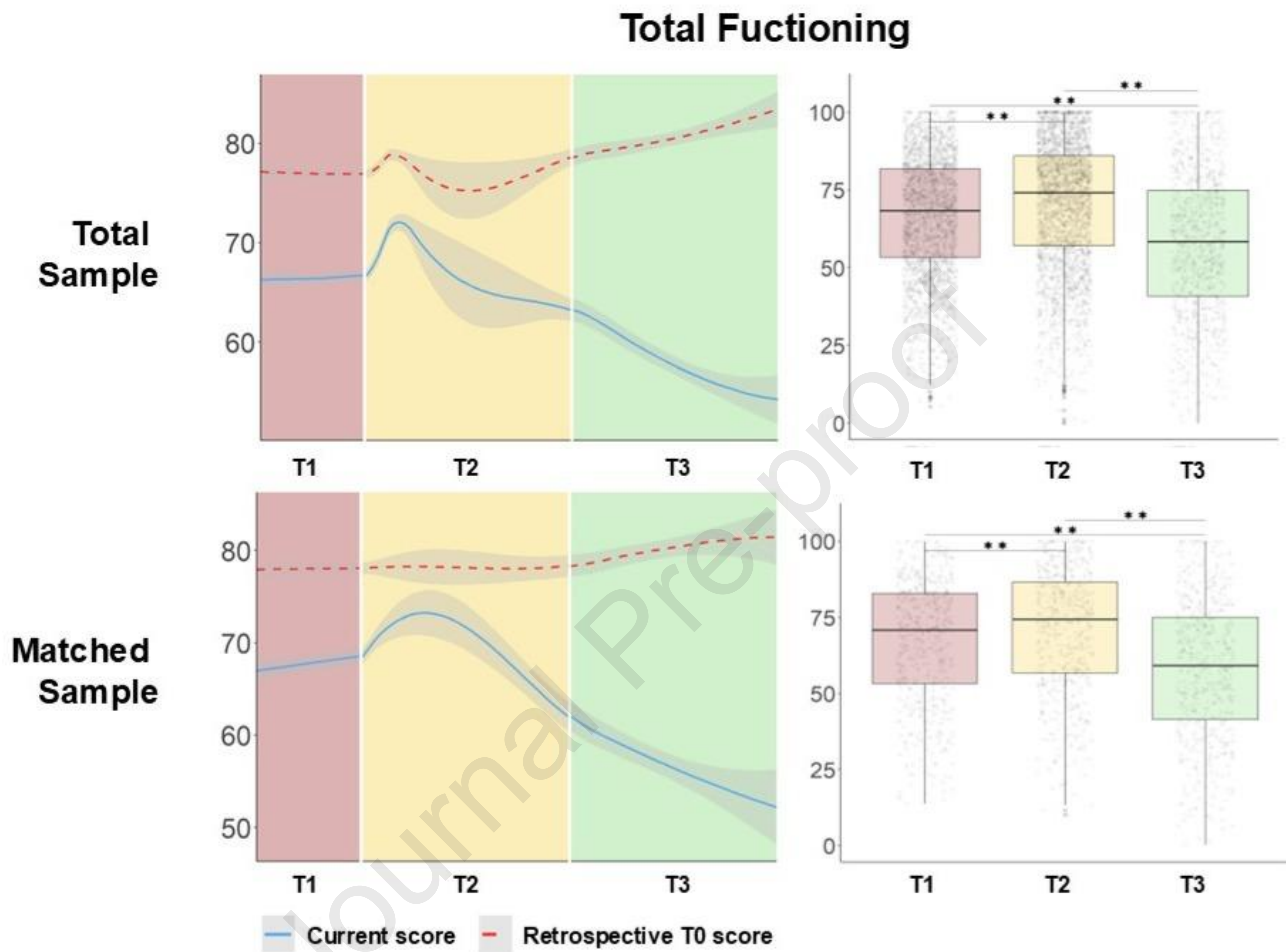

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Figure 3. Intra-pandemic (T1-T3) and retrospective pre-pandemic (T0) tobacco, alcohol, cannabis and substance consumption scores and their differences across time in the total and matched sample.

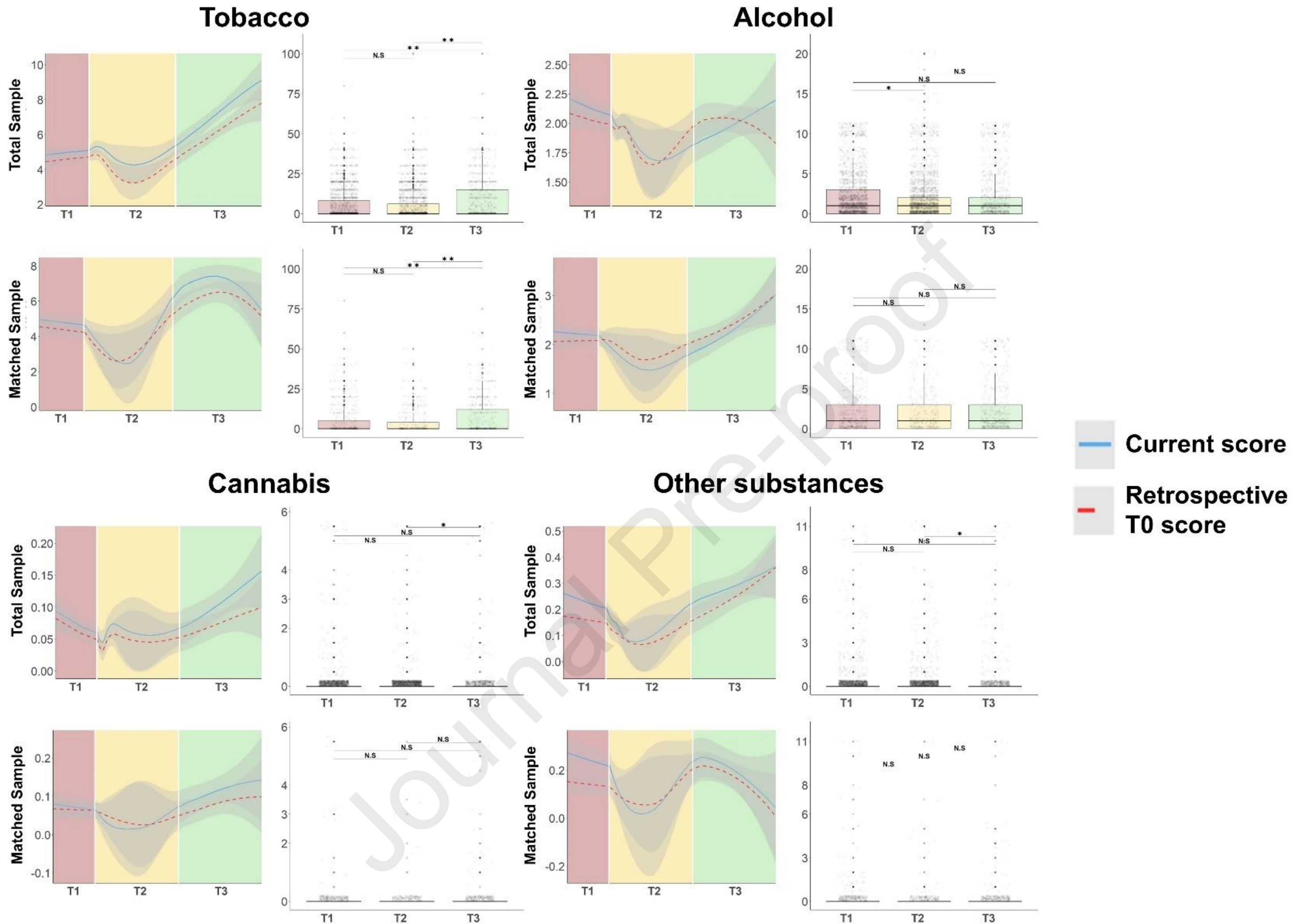

Figure Legend:

Smoking consumption defined as average number of smoked cigarettes per day in the past 2 weeks. Alcohol consumption defined as average number of alcohol units (1 drink/1 beer) per day in the past 2 weeks. Cannabis consumption defined as average gram of smoked cannabis per day in the past 2 weeks. Other substance consumption defined as number of individual substance intakes in the past 2 weeks.

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Figure 4. Ratings of importance of coping strategies across time (T1-T3, A-C).

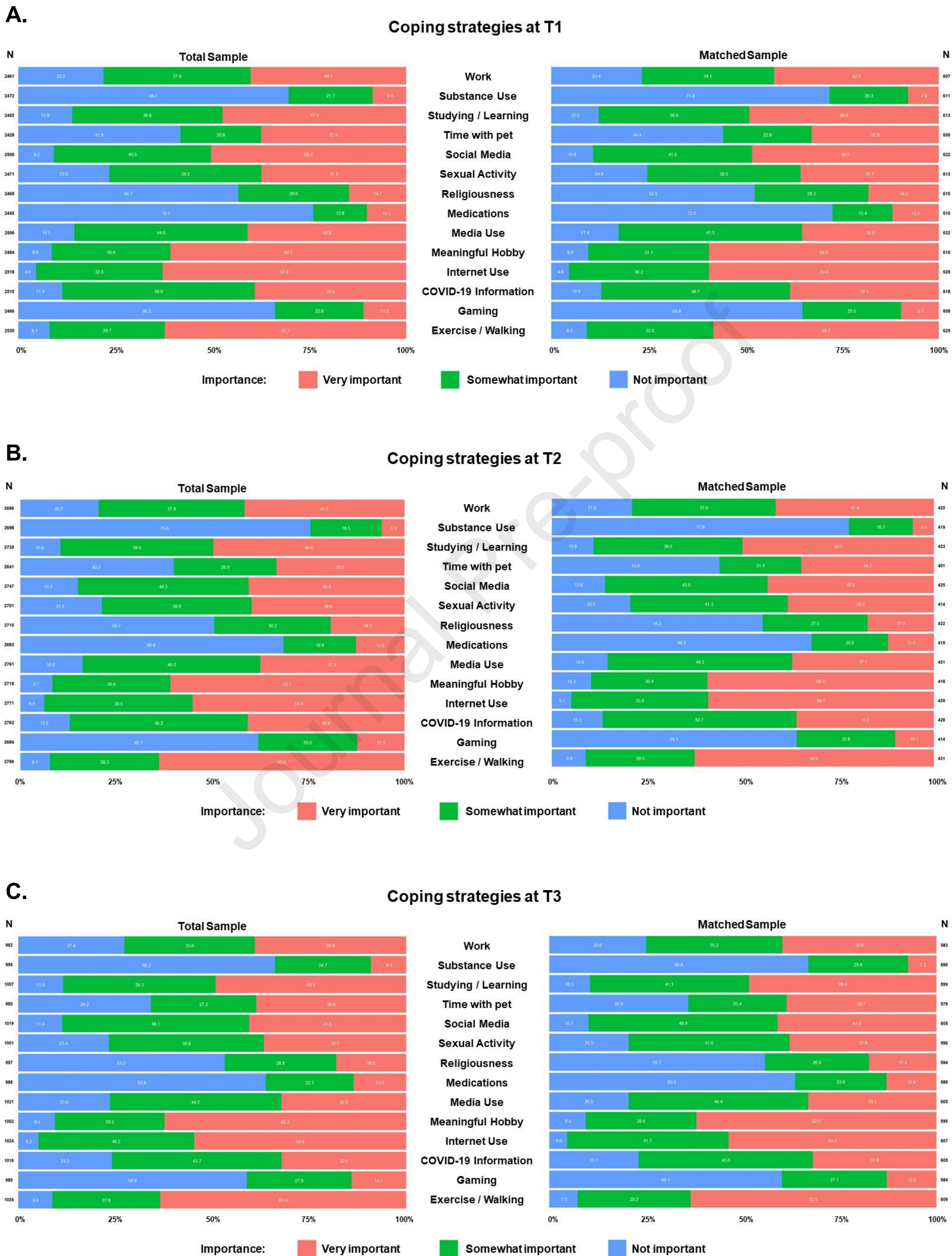

Figure Legend:
Missing values in all answers varied from 36.0 - 43.5%.

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Table 1. Descriptives of demographics and non-modifiable factors across T1, T2 and T3 in the total and matched sample.

		Total Sample (N = 10,283)			Matched Sample (N = 2,737)		
Category	**Variable**	**T1 N = 3,940**	**T2 N = 4,675**	**T3 N = 1,668**	**T1 N = 887**	**T2 N = 997**	**T3 N = 853**
Demographics	**Age**						
	Mean (Sd)	38.7 (13.1)	44.5 (14.2)	47.5 (14.0)	41.9 (15.0)	45.2 (15.4)	46.0 (15.4)
	Median (Q1, Q3)	38.0 (28.0, 48.0)	45.0 (34.0, 55.0)	50.0 (38.0, 58.0)	41.0 (29.0, 55.0)	46.0 (31.0, 58.0)	48.0 (33.0, 59.0)
	Missing (%)	426 (10.8%)	642 (13.7%)	235 (14.1%)	0 (0%)	0 (0%)	0 (0%)
	Gender						
	Male	858 (24.5%)	1663 (41.6%)	488 (34.8%)	397 (44.8%)	507 (50.9%)	404 (47.4%)
	Female	2628 (75.1%)	2328 (58.2%)	906 (64.7%)	490 (55.2%)	490 (49.1%)	449 (52.6%)
	Trans / Non-binary / Other	12 (0.4%)	7 (0.2%)	7 (0.5%)	0 (0%)	0 (0%)	0 (0%)
	Missing (%)	442 (11.2%)	677 (14.5%)	267 (16.0%)	0 (0%)	0 (0%)	0 (0%)
	Ethnicity						
	White / Caucasian	3453 (98.6%)	3937 (98.5%)	1418 (98.9%)	874 (98.7%)	976 (98.3%)	839 (98.7%)
	Other	49 (1.4%)	58 (1.5%)	16 (1.1%)	12 (1.3%)	17 (1.7%)	11 (1.3%)
	Missing (%)	438 (11.1%)	680 (14.6%)	234 (14.0%)	1 (0.1%)	4 (0.4%)	3 (0.4%)
	Marital status						
	Single / never married	1755 (50.2%)	1386 (34.6%)	475 (33.2%)	382 (43.3%)	351 (35.3%)	332 (39.2%)
	Married / co-living partner	1415 (40.5%)	2172 (54.3%)	710 (49.6%)	406 (46.0%)	540 (54.3%)	399 (47.1%)
	Widowed	48 (1.4%)	74 (1.9%)	47 (3.3%)	17 (1.9%)	12 (1.2%)	17 (2.0%)
	Divorced or separated	277 (7.9%)	370 (9.2%)	199 (13.9%)	78 (8.8%)	91 (9.2%)	99 (11.7%)
	Missing (%)	445 (11.3%)	673 (14.4%)	237 (14.2%)	4 (0.5%)	3 (0.3%)	6 (0.7%)
	Education						
	None	2 (0.1%)	4 (0.1%)	5 (0.3%)	1 (0.1%)	1 (0.1%)	3 (0.4%)
	Primary school	9 (0.3%)	30 (0.8%)	21 (1.6%)	2 (0.2%)	4 (0.4%)	12 (1.4%)
	High school	744 (21.2%)	887 (22.2%)	407 (28.3%)	195 (22.1%)	220 (22.2%)	245 (28.8%)
	College/university degree	2436 (69.5%)	2632 (65.7%)	880 (61.2%)	580 (65.6%)	603 (60.8%)	521 (61.3%)
	PhD	311 (8.9%)	446 (11.2%)	124 (8.6%)	106 (12.0%)	164 (16.5%)	69 (8.1%)
	Missing (%)	438 (11.1%)	676 (14.5%)	231 (13.9%)	3 (0.3%)	5 (0.5%)	3 (0.4%)
	Student Status						
	No	2375 (69.4%)	3091 (79.6%)	1118 (80.5%)	609 (69.9%)	765 (79.6%)	620 (74.9%)
	Yes	1049 (30.6%)	790 (20.4%)	270 (19.5%)	262 (30.1%)	196 (20.4%)	208 (25.1%)
	Missing (%)	516 (13.1%)	794 (17.0%)	280 (16.8%)	16 (1.8%)	36 (3.6%)	25 (2.9%)

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Employment	**Currently employed**						
	No	1326 (38.1%)	1366 (34.5%)	666 (46.8%)	323 (36.8%)	351 (36.1%)	404 (47.9%)
	Yes	2150 (61.9%)	2588 (65.5%)	756 (53.2%)	555 (63.2%)	622 (63.9%)	439 (52.1%)
	Missing (%)	464 (11.8%)	721 (15.4%)	246 (14.7%)	9 (1.0%)	24 (2.4%)	10 (1.2%)
	Employment branch						
	Health worker	591 (28.1%)	447 (17.9%)	182 (25.1%)	245 (45.2%)	84 (14.0%)	112 (26.5%)
	Education	348 (16.5%)	480 (19.3%)	116 (16.1%)	64 (11.8%)	151 (25.2%)	67 (15.9%)
	Entrepeneur	196 (9.3%)	257 (10.3%)	45 (6.3%)	31 (5.7%)	59 (9.8%)	28 (6.6%)
	Finance operator	90 (4.3%)	118 (4.7%)	23 (3.2%)	16 (3.0%)	25 (4.2%)	13 (3.1%)
	Food industry	33 (1.6%)	46 (1.8%)	11 (1.5%)	7 (1.3%)	16 (2.7%)	8 (1.9%)
	Freelance	248 (11.8%)	285 (11.4%)	106 (14.6%)	44 (8.1%)	78 (13.0%)	70 (16.6%)
	Information Technology (IT)	78 (3.7%)	81 (3.3%)	20 (2.8%)	15 (2.8%)	18 (3.0%)	11 (2.6%)
	Manager	51 (2.4%)	87 (3.5%)	11 (1.5%)	18 (3.2%)	21 (3.5%)	5 (1.2%)
	Military/police/firefighters	26 (1.2%)	45 (1.8%)	21 (2.9%)	14 (2.6%)	11 (1.8%)	11 (2.6%)
	Religious	0 (0%)	0 (0%)	1 (0.1%)	0 (0%)	0 (0%)	1 (0.2%)
	Retail	69 (3.3%)	94 (3.8%)	30 (4.1%)	15 (2.8%)	15 (2.5%)	18 (4.3%)
	Other	374 (17.8%)	551 (22.1%)	158 (21.8%)	73 (13.5%)	121 (20.3%)	78 (18.5%)
	Missing (%)	1836 (46.6%)	2184 (46.7%)	944 (56.6%)	345 (38.9%)	398 (39.9%)	431 (50.5%)
Household details	**Co-living persons**						
	Mean (Sd)	2.1 (1.5)	2.2 (1.5)	2.0 (1.7)	2.2 (1.5)	2.2 (1.5)	2.0 (1.7)
	Median (Q1, Q3)	2.0 (1.0, 3.0)	2.0 (1.0, 3.0)	2.0 (1.0, 3.0)	2.0 (1.0, 3.0)	2.0 (1.0, 3.0)	2.0 (1.0, 3.0)
	Missing (%)	456 (11.6%)	699 (15.0%)	244 (14.6%)	5 (0.6%)	8 (0.8%)	9 (1.1%)
	Living with family						
	No	314 (10.7%)	358 (10.6%)	143 (12.5%)	74 (9.9%)	82 (9.6%)	83 (12.4%)
	Yes	2621 (89.3%)	3029 (89.4%)	997 (87.5%)	671 (90.1%)	773 (90.4%)	587 (87.6%)
	Missing (%)	1005 (25.5%)	1288 (27.6%)	528 (31.7%)	142 (16.0%)	142 (14.2%)	183 (21.5%)
	Urbanicity						
	Village / rural area	285 (8.1%)	427 (10.7%)	128 (8.9%)	115 (13.0%)	129 (12.9%)	75 (8.8%)
	Small-size town	734 (20.9%)	1018 (25.4%)	378 (26.2%)	273 (30.8%)	297 (29.8%)	239 (28.0%)
	Medium-size town	457 (13.0%)	687 (17.1%)	206 (14.3%)	85 (9.6%)	89 (8.9%)	116 (13.6%)
	Large city	2032 (57.9%)	1877 (46.8%)	727 (50.6%)	414 (46.6%)	482 (48.4%)	423 (49.6%)
	Missing (%)	432 (11.0%)	666 (14.2%)	227 (13.6%)	0 (0%)	0 (0%)	0 (0%)

Table legend:

Definition of urbanicity: small town: 10,000-100,000 population, medium-size town: 100,000-500,000 population, large city: over 500,000 population). Statistics are reported as valid number of answers (percentage, %), numbers (mean/sd, median/Q1,Q3) and visual analog scale (VAS) scores (mean/sd, median/Q1,Q3). % is referred to valid answers only, missing % is referred to the total number of participants.

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Highlights

- This is the largest online mental health, multi-wave, COVID-19 survey in Greece.
- Behavioral ratings were assessed pre- and in 3 distinct intra-pandemic time points.
- Lockdowns negatively affected behavioral and coping strategies.
- Substance consumption and domestic violence showed transient increases.

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FUNDING STATEMENT

All institutions and funding agencies of the COH-FIT project have been previously published elsewhere (Solmi et al., 2022a). For Greece only, additional funding for advertisement has been acquired through personal funds of AA and KT.

CONFLICT OF INTEREST STATEMENT

Conflict of interest statements of all authors have been previously published elsewhere (Solmi et al., 2024).

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