Title: Assessing caring activities in French adolescents and young adults: Relevance of the Multidimension Assessment of Caring Activities for Young Carers (MACA-YC18)

Running head: *VALIDATION OF THE FRENCH VERSION OF THE MACA-YC18*

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ABSTRACT

Background. Young carers (YC) and young adult carers (YAC) have become of interest in research and practice. The 18-item Multidimensional Assessment of Caring Activities for Young Carers (MACA-YC18) was developed for identifying the extent and nature of caring activities across six domains: domestic chores, household management, financial/practical help, personal care, emotional care, and sibling care. The aim of this research was to investigate the psychometric properties of the French version of the MACA-YC18.

Methods. Two quantitative studies were conducted in a general population among adolescents and young adults. The sample was composed of 2,688 adolescents (Mage = 16.08; SDage = 0.98; 60.60% girls) in Study 1 and 1,192 young adults (Mage = 20.52; SDage = 1.89; 78.27% girls) in Study 2. The psychometric properties were examined via construct validity through internal consistencies, confirmatory factorial analysis, and invariance measurement regarding: gender (girls vs. boys), having a sick/disabled relative (having vs. not), relative's type of illness/disability (physical illness vs. mental illness vs. other illnesses/disabilities), providing support to a sick/disabled relative (providing vs. not), and living arrangement (with family vs. not).

Results. In both studies, internal consistencies were in line with those reported in the literature, the 6-factor structure was confirmed, and strict invariances were highlighted.

Conclusions. Results show that the French version of the MACA-YC18 has good psychometric properties regarding construct validity not only among adolescents but also among young adults. This instrument appears to be a relevant screening tool for identifying and characterizing young carers in the general population.

KEY MESSAGE

- The MACA-YC18 is an instrument that measures the extent and nature of caring activities through six dimensions.
- The MACA-YC18 was originally developed exclusively for young carers and was later extended to youth in the general population.
- This study shows the good construct validity of the French version of the MACA-YC18.
- This study suggests that the MACA-YC18 is a relevant tool for identifying YC like YAC among the general population.
- The MACA-YC18 can be used for group comparison among the general population considering YC and YAC specificities.

INTRODUCTION

When a person provides regular, non-professional help with daily activities or emotional support to a family member who has an illness or disability, he/she is called a caregiver (Blanc, 2010). Although literature had been devoted to adult caregivers, in recent years, the question of young carers has also been raised (Jarrige et al., 2020). A young carer (YC) is defined as "children or young persons under 18 who provide or intend to provide care, assistance or support to another family member. They carry out, often on a regular basis, significant or substantial caring tasks and assume a level of responsibility that would usually be associated with an adult. The person receiving care is often a parent but can be a sibling, grandparents or other relatives who is disabled, has some chronic illness, mental health problem or other condition connected with a need for care, support or supervision" (Becker, 2000, p. 378). This definition had been extended to young adult carers (YAC) as people aged 18–25 years (Becker & Becker, 2008). In most studies, the label "young carers" includes YC

as well as YAC (e.g., Becker & Sempik, 2019; Joseph, Becker, Becker, et al., 2009; Kavanaugh, 2014; Sempik & Becker, 2014).

YC has become an international societal issue, as several countries have attempted to identify and characterize YC among their populations in order to develop governmental support strategies (Becker, 2007). This growing body of interest increases the importance of having specific and valid instruments to determine the characteristics of YC and YAC.

Being a Young Carer during Adolescence and Young Adulthood

The prevalence of YC reported in literature is quite heterogenous. In the United Kingdom, there would be 9 to 22% of YC under 18 years (Warren and Ruskin, 2008; Joseph et al., 2019); 2.8% to 6.6% between 15–24 years in Italy (Boccaletti, 2016; Landi et al. 2020); 6.1% between 10–22 years in Germany (Metzing et al., 2020); 3.5% between 5–18 years in Austria (Nagl-Cupal et al., 2014); 3.2% between 8–18 years in the United States (Hunt et al., 2005); 7% under 25 years in Australia (Australian Bureau of Statistics, 2018); 7.7% between 10–15 years in Switzerland (Leu et al., 2019); and 14.3% between 15–17 years in France (Untas et al., 2022). Becker (2007) estimated that 2–4% of young people in the United Kingdom, Australia, and the United States could be considered YC. There are several reasons for the heterogeneity of prevalence, such as the lack of distinction between children, adolescents, and young adults, or the lack of consensus on the identification criteria (Newman, 2002).

Although the literature often considers YC in a general manner, some differences between being a YC during adolescence and young adulthood have been noted. While taking on caring activities is considered less appropriate for YC because they are children, for YAC it is seen as conforming to individual, societal, and familial norms (Becker & Becker, 2008). Besides, YAC are in a developmental stage of life of emerging adulthood (Arnett, 2000),

during which they will have more exposure to additional stress and distraction (Becker & Sempik, 2019) due to several life transitions such as moving from high school to university and leaving home (Macmillan, 2006). According to Becker and Becker (2008), for YAC, there is an increasing number of other demands on their time alongside their caring responsibilities. This observation highlights the importance of investigating caring activities in terms of the distinction between adolescence and young adulthood.

Concerning the lack of consensus on identification criteria (Newman, 2002), it is noteworthy that in some research, YC refers to a person who has a sick relative (e.g., Pakenham et al., 2006) whereas in others, a YC is a person who reports supporting and helping a sick/disabled relative (e.g., Barthélémy et al., 2017; Greene et al., 2017). However, being a YC is more than just having a sick/disabled relative (Becker, 2000; Blanc, 2010). For young people, different characteristics have been identified as reasons for becoming a carer, such as gender, type of illness/disability, or living arrangement. Indeed, girls more frequently become caregivers than boys (Aldridge & Becker, 1993; Rose & Cohen, 2010). The nature and severity of illness have been pointed out as the most important reason leading to a young person becoming a caregiver (Dearden & Becker, 2004) as is living within the same household (Becker, 2007).

Measuring Caring Activities: Development of the Multidimensional Assessment of Caring Activities-Young Carers

Caring activities are considered part of the "caregiving continuum" that determines how much help a young person provides in daily life (Becker, 2007). All young people could provide help in daily life, they will be identified as YCs when they have a sick/disabled relative and based on the extent and nature of his/her caring activities and responsibilities

(Becker, 2007; Warren, 2005). YCs can be involved in many different tasks (Dearden & Becker, 2004).

Joseph et al. (2009) proposed developing an instrument that measures the extent and nature of caring activities: the Multidimensional Assessment of Caring Activities for Young Carers (MACA-YC). The MACA-YC is a self-report instrument that yields an index of the total amount of caring activity undertaken by young persons as well as that in specific dimensions: domestic chores, household management, financial/practical help, personal care, emotional care, and sibling care (Joseph, Becker, & Becker, 2009). *Domestic chores* refers to activities such as cleaning, cooking, and washing dishes or clothes. *Household management* refers to activities undertaken to keep the household running, such as shopping, household repairs, or lifting heavy objects. *Financial/practical help* refers to activities related to financial management (e.g., bills, social benefits, banking) and that engage the young person in practical adult responsibilities such as working part-time or interpreting. *Personal care* refers to activities such as helping to dress and undress, to wash and use the bathroom, and to administer health care (e.g., administering medicine, changing dressing). *Emotional care* refers to activities where the youth provides company and emotional support by, for example, watching the person they care for or providing supervision. Finally, *sibling care* refers to activities such as looking after siblings.

Gender and type of illness/disability appear to influence the extent and nature of the caring activities. Some difference among gender has been shown, with a wide range of results. In the study by Becker and Sempik (2019), girl YC may score higher than boy YC for *domestic chores, personal care, emotional care,* and *sibling care*, whereas Leu et al. (2019) reported that there was no difference within the *sibling care* dimension; Joseph et al. (2019) reported that there was only an effect in the *domestic chores* dimension. In addition, regarding the type of illness/disability, Kallander, Weimand, Becker, et al. (2017) demonstrated that YC

with a relative with a physical illness had higher scores for *domestic chores* and *emotional care* than those with a relative with a substance use disorder. Above all, different characteristics (i.e., gender, having a sick/disabled relative, relative's type of illness/disability, providing support to a sick/disabled relative, living arrangement) appear to be essential in assessing caring activities in adolescence and young adulthood.

There are 42-item and 18-item versions of the MACA-YC. The 18-item version has been recommended for use in research and practical contexts because it is shorter and has been validated (Joseph, Becker, Becker, et al., 2009). A MACA-YC18 total score can be obtained by totaling all dimensions and range from 0 to 36 (i.e., items rating scale from 0 = *never* to 2 = *a lot of time*). Joseph, Becker and Becker (2009) proposed the following categories of interpretation: 0 points indicates no caring activity; between 1 and 9 points refers to a low amount of caring activity; between 10 and 13 points indicates a moderate amount of caring activity; between 14 and 17 points indicates a high amount of caring activity; and >17 points indicates a very high amount of caring activity. The MACA-YC18 was originally developed towards YC only. Thus, it can be used only by young people who have already been identified as YC. More recently, to extend the instrument to all young people, Joseph et al. (2019) proposed an adaptation of seven items (i.e., items 9, 10, 11, 12, 13, 14, and 15) which had the particularity to specify that the caring activity was related to the person for which the young people cared. For example, item 11 was originally "Help the person you care for to have a wash" and became "Help someone in the house to have a wash". This adaptation used the same categories of interpretation as before (Joseph et al., 2019). Such a perspective allows the use of the MACA-YC18 among all young people regardless of whether they undertake caring activities or not. The MACA-YC18 then became a screening tool that identifies YC and highlights the difference between normal helping activities and caring activities.

The MACA-YC18 is recommended for investigating the amount of caring activity, for comparing different groups, and for examining the association between caring activities and other factors or the effects of an intervention (Joseph, Becker, & Becker, 2009). In the literature, the MACA-YC18 has been used mostly among children and adolescents (Table 1). The MACA-YC18 is available in English, Norwegian, Swedish, German, French, and Italian. Regarding its psychometric properties, Joseph et al. (2009) demonstrated for the original version acceptable fidelity, construct validity with six dimensions, and convergent validity with the number of hours of caring and the number of school days missed. It is worth noting that internal consistencies were lower in three dimensions (i.e., domestic chores, household management, financial/practical help) compared to others. This finding could be explained by the fact that these three dimensions cover a wide range of activities of daily living (e.g., from cleaning to cooking for the domestic chores dimension) and are then conceptualized as having several different aspects. This conceptualization explains the weakest of the internal consistencies (Streiner, 2003). Since this publication, only six studies out of nine have examined instrument fidelity, and none of them have considered other psychometric properties (see Table 1). In addition, the Norwegian, Swedish, German, and Italian versions of the MACA-YC18 have not undergone psychometric validation. While the MACA-YC18 has been recommended for group comparisons (Joseph, Becker, & Becker, 2009), no study has investigated construct validity through invariance measurement. The psychometric validation of construct validity in the French version of the tool would therefore provide deeper information about the relevance of the MACA-YC18 among samples of adolescents and young adults.

< Insert Table 1 here >

Present Research

The MACA-YC was originally developed among a sample of YC that included children, adolescents, and young adults (Joseph, Becker, Becker, et al., 2009). It was then mostly used with children and adolescents in several languages without reporting the psychometric properties (see Table 1). The psychometric properties of the instrument within samples of adolescents and young adults are still unknown. Likewise, the MACA-YC was used in YC, in young people with a sick/disabled relative, or in a general population (see Table 1) without investigating the items' relevance and instrument structure. Moreover, as Joseph et al. (2019) suggested extending the MACA-YC to become a screening tool, it also appeared important to specify the construct validity regarding the characteristics that lead to a young person becoming a caregiver (i.e., gender, relative's type of illness/disability, living arrangement).

The aim of the present research was to explore the psychometric properties of the French version of the MACA-YC18 in a general population of adolescents and young adults. To do so, two studies were performed: Study 1 was conducted among adolescents, and Study 2 involved young adults. In both studies, the same approach was followed to explore the relevance of the instrument as a screening tool. This approach consisted of investigating its psychometric properties through construct validity. Specifically, for both studies, in accordance with the literature (Järkestig-Berggren et al., 2019; Joseph, Becker, Becker, et al., 2009), we hypothesized that there would be acceptable internal consistencies for the total score and three dimensions (i.e., personal care, emotional care, sibling care), and poorer ones for three other dimensions (i.e., domestic chores, household management, financial/practical help). Next, the 6-factor structure should be highlighted and invariance measurement should demonstrate that the MACA-YC18 can be used for comparing the extent and nature of caring activities regarding different characteristics: gender, having a sick/disabled relative, relative's type of illness/disability, providing support to a sick/disabled relative, and living arrangement.

STUDY 1

Method

Participants and Procedure

The sample consisted of 2,688 French adolescents (M_{age} = 16.08; SD_{age} = 0.98; 60.60% girls; age range: 15–18 years) in grades 10–12 from several high schools. The sociodemographic characteristics are presented in Table 2. Most participants lived with their parents (96.08%) and had siblings (93.53%). Up to 26.45% of the participants had a sick/disabled relative, of which 41.49% had a physical illness (e.g., cancer, diabetes), 19.55% had a mental illness (e.g., addiction, depression), and 38.96% had other illnesses/disability (e.g., paraplegia, myopathy). Of the participants, 15.12% reported supporting a relative with an illness or disability. Each participant and their parents provided informed consent. Data were collected voluntarily through a self-reported, anonymous questionnaire.

< Insert Table 2 here >

Questionnaire

The questionnaire included the MACA-YC18 and collected sociodemographic information (including age, gender, school grade, household composition), information about having a sick/disabled relative, relative's type of illness/disability (physical illness, mental illness, substance abuse, disability, or other health issue), and if they provided regular support to a relative.

The MACA-YC18 items (Joseph et al., 2019) were translated from English into French by Leu et al. (2019) among a French-speaking Swiss sample. To consider all young people, whether or not they lived in the family household, the sentence "in the house" had been removed from the items. For example, item 11 was originally "Help someone in the

house to have a wash" and was adapted to "Help someone to have a wash". The French items are reported in APPENDIX 1. In the present study, the French adaptation had been pretested on eight French adolescents. All items were found to be clear and easily understandable. The number of items and the instruction were similar to the original version. Item scoring ranged from 0 (= *never*) to 2 (= *a lot of the time*).

Plan of Analysis

To report the psychometric properties of the French version of the MACA-YC18, analyses were conducted to test the instrument's construct validity. The percentage of missing values was 1.85% for sociodemographic variables, which was addressed with listwise deletion. First, the internal consistency was analyzed using two indicators: Cronbach's alpha and McDonald's omega (Dima, 2018).

Second, a confirmatory factor analysis (CFA) and invariance measurements were performed. For the CFA, diagonally weighted least squares estimation using polychoric correlation matrix was used to take into account the ordinal nature of the data. The results were interpreted regarding conventional criteria (e.g., Hooper et al., 2008; CFI > .95, TLI > .95, RMSEA < .07). For the invariance measurement, we considered different variables, which led to the constitution of different subgroups: *gender* (girls vs. boys); *sick/disabled relative* (having a sick/disabled relative vs. not having one); *types of illness/disability* (having a relative with a physical illness vs. mental illness vs. other illnesses/disabilities); and *providing support* (providing support to a sick/disabled relative vs. not providing). As 95.91% of the sample still lived in the family household, we did not examine invariance measurement across the living arrangement group. Preliminary, two CFA were conducted separately for each group. Next, a series of multiple-group CFA models with progressively more stringent constraints was realized. Four models were tested: configural, metric, scalar, and strict

invariance (van de Schoot et al., 2012). Configural invariance was specified to have the same pattern of fixed and free parameters across groups, but not equality constraints. It enabled the examination of whether the same items measured the same constructs across groups. In metric invariance, only the factor loadings were constrained to be equal across groups. This model implied that the same latent variables were being measured across groups. Scalar invariance was tested by specifying that factor loadings and thresholds were invariant across groups. Strict invariance had an additional constraint in that unique variances were invariant across groups. A more constrained model was rejected when: (a) the chi-square difference test had a probability of <.05 (Byrne & van de Vijver, 2010), (b) the ΔRMSEA had an increase of >.015 (Chen, 2007), and (c) the ΔCFI had a decrease of >.010 (Cheung & Rensvold, 2002). All analyses were performed in R 4.1.2. software using lavaan and semTools packages.

Results

Descriptive Statistics, Correlations, and Internal Consistency

The descriptive statistics (i.e., means and standard deviation), internal consistencies, and bivariate correlations between the MACA-YC18 dimensions and total score are reported in Table 3. All of the six dimensions were positively interrelated (.45 > *r* >.16). The total score was significantly correlated with all dimensions and presented moderate and highly positive correlations (.73 > *r* > .54).

Concerning internal consistency, three dimensions (i.e., *personal care*, *emotional care*, *sibling care*), as the total score, presented high consistencies with Cronbach's alpha and McDonald's omega of between .78 and .90. The *domestic chores, household management*, and *financial/practical help* dimensions revealed weaker consistencies (.41 < α < .53 and .42 < Ω < .58).

< Insert Table 3 here >

Factor Analysis and Measurement Invariance across the Gender, Sick Relative, Type of Illness/Disability, and Providing Support Groups

For the CFA, the initial estimation of the 6-factor model yielded a good fit to the data: χ^2 (120) = 411.92, RMSEA = .030 [.027–.033], CFI = .99, TLI = .99, WRMR = 1.22. Next, measurement invariance was tested for groups regarding *gender*, *sick/disabled relative*, *types of illness/disability*, and *providing support*. CFA was conducted for each group. All fit indices are reported in Table 4, and all groups showed acceptable criteria.

< Insert Table 4 here >

Then, a series of multiple-group CFA models with progressively more stringent constraints was calculated (Table 5). For invariance across *gender* (girls vs. boys), the configural invariance model showed acceptable criteria and could be used as the baseline model. Metric invariance model presented a decrease of .001 for ΔRMSEA and of .001 for ΔCFI, but a significant χ^2 difference test ($p < .05$). As the chi-square difference test is sensitive to sample size (Milfont & Fischer, 2010), ΔRMSEA and ΔCFI can be considered better indicators of significant improvement. The metric invariance model was then accepted. The scalar invariance model showed a significant χ^2 difference ($p < .001$) and acceptable criteria for the ΔRMSEA and ΔCFI indicators. As for the metric invariance model, the scalar invariance model was accepted. The strict invariance model had good fit and was not rejected. Full strict invariance was then revealed, as all factor loadings, thresholds, and unique variances provided to be invariant across the *gender* groups.

For invariance across *sick/disabled relatives* (having a sick relative vs. not having one), the configural invariance model presented good fit and could be used as the baseline model. The metric invariance model presented a significant χ^2 difference test ($p < .05$), but as the ΔRMSEA and ΔCFI indicators were acceptable, the model was accepted. Scalar

invariance showed acceptable criteria and was not rejected as the strict invariance model. Subsequently, all factor loadings, thresholds, and unique variances provided to be invariant across the *sick/disabled relatives* groups. There was then full strict invariance.

For invariance across *types of illness/disability* (having a sick/disabled relative with a physical illness vs. mental illness vs. other illnesses/disabilities), the configural invariance model showed acceptable criteria and could be used as the baseline model. The metric invariance model had good fit and was not rejected, as were the scalar invariance and strict invariance models. Full strict invariance was demonstrated, as all factor loadings, thresholds and unique variances provided to be invariant across the *types of illness/disability* groups.

Finally, for invariance across *providing support* (providing support to a sick/disabled relative vs. not providing), the configural invariance model presented acceptable criteria and was used as the baseline model. The metric invariance model had good fit and was not rejected. The scalar invariance model presented a significant χ^2 difference test ($p < .01$) and was not rejected in terms of the ΔRMSEA and ΔCFI indicators. The scalar invariance model had good fit and was not rejected, as was the strict invariance model. All factor loadings, thresholds, and unique variances provided to invariant across the *providing support* groups. A full strict invariance model was revealed.

< Insert Table 5 here >

STUDY 2

Participants and Procedure

The sample was composed of 1,192 French young adults (M_{age} = 20.52; SD_{age} = 1.89; 78.27% girls; age range: 18–25 years) enrolled at undergraduate and graduate level in different curricula (48.61% in literature, art and human sciences; 21.94% in law and economics; 15.18% in sciences and technology; 8.70% in medicine school; 4.35% in engineer

sciences; 1.30% in school-teaching studies). The criteria for inclusion in the study were: aged between 18 and 25 years, enrolled in a curriculum, and without children. The sociodemographic characteristics are reported in Table 6. Concerning living arrangements, 41.01% of the participants had left the family household and 45.72% lived alone. Of the participants, 60.82% had a sick/disabled relative, among whom 73.50% had a physical illness (e.g., cancer, diabetes), 20.61% had a mental illness (e.g., addiction depression), and 5.89% had other illnesses/disabilities (e.g., paraplegia, myopathy). Up to 26.68% of the participants indicated that they provided support to a relative with illness/disability. Each participant provided informed consent, and data were collected voluntarily through a self-reported, anonymous questionnaire.

< Insert Table 6 here >

Measure

As in Study 1, the participants completed the ad hoc sociodemographic questionnaire as well as the French version of the MACA-YC18. For this study, the French adaptation was also pretested with 13 French young adults. All items were found to be clear, but for some items (e.g., item 2, “Clean other rooms”; item 16, “Take brothers or sisters to school”), several respondents indicated that they were not concerned because they had left the family household. Therefore, the item scoring was modified by adding a modality “does not concern me”. The number of items and instructions were then similar to the version for adolescents.

Plan of Analysis

The same analyses as in the Study 1 were conducted. The percentage of missing values were 13.08% for sociodemographic variables; listwise deletion was used to address this. First, internal consistency was considered. Second, a CFA was used, and invariance

measurement was performed considering *living arrangement* (living with the family vs. not living with family) as well as the same group variables as in Study 1. It is worth noting that the *types of illness/disability* group was not considered, as insufficient participants in the sample reported having a relative with other illnesses/disabilities. As in Study 1, the same conventional criteria were used for CFA and invariance measurement interpretation. All analyses were performed in R 4.1.2. software using lavaan and semTools packages.

Results

Descriptive Statistics, Correlations, and Internal Consistency

All descriptive statistics, bivariate correlations, and internal consistencies are reported in Table 3. The six dimensions of the MACA-YC18 were significantly interrelated and revealed positive relations ($.41 > r > .09$). The total score was also positively related to each dimension ($.95 > r > .12$).

The internal consistencies through Cronbach's alpha and McDonald's omega revealed that, as in Study 1, three dimensions had weaker consistencies ($.41 < \alpha < .45$ and $.45 < \Omega < .49$): *domestic chores*; *household management*, and *financial/practical help*. The three other dimensions (i.e., *personal care*, *emotional care*, *sibling care*), like the total score, showed good internal consistencies ($.80 < \alpha < .88$ and $.81 < \Omega < .89$).

Factor Analysis and Measurement Invariance across the Gender, Sick/Disabled Relative, Providing Support, and Living Arrangement Groups

For the CFA, the initial estimation of the 6-factor model yielded a good fit to the data: χ^2 (120) = 447.97, RMSEA = .048 [.043–.053], CFI = .97, TLI = .98, WRMR = 1.36. For the measurement invariance, invariance across the *gender*, *sick/disabled relative*, *providing*

support, and *living arrangement* groups were performed. First, CFA was conducted for each group. Table 4 reported all fit indices. The results showed acceptable criteria in all groups.

Second, a series of multiple-group CFA models with progressively more stringent constraints was undertaken. The results are reported in Table 7. For invariance across *gender* (girls vs. boys), the configural invariance model could be used as the baseline model, as it presented acceptable criteria. The metric invariance model good fit and was not rejected. The scalar invariance model had a significant χ^2 difference test ($p < .001$), with an increase of .002 for ΔRMSEA and a decrease of .003 for ΔCFI. Scalar invariance was then accepted. The strict invariance model had good fit and was accepted. These results showed full strict invariance, as all factor loadings, thresholds, and unique variances were invariant across the *gender* groups.

For invariance across *sick/disabled relative* (having a sick/disabled relative vs. not having one), the configural invariance model presented good fit and could be used as the baseline model. The metric invariance model revealed acceptable criteria and was not rejected. The Scalar invariance model and strict invariance model also had good fit and were not rejected. All factor loadings, thresholds, and unique variances were invariant across the *sick/disabled relative* groups. Full strict invariance was reached.

For invariance across *providing support* (providing support to a sick/disabled relative vs. not providing), the configural invariance model had good fit and was used as the baseline model. The metric invariance model as well as the scalar invariance model and the strict invariance model, presented acceptable criteria and were not rejected. A full strict invariance model was then revealed, as all factor loadings, thresholds, and unique variances were invariant across the *providing support* groups.

Finally, for invariance across *living arrangement* (living with family vs. not living with family), the configural invariance model had good fit and could be used as the baseline

model. The metric invariance model presented acceptable criteria and was not rejected. The scalar invariance model presented a significant χ^2 difference test ($p < .001$), but as the ΔRMSEA and ΔCFI indicators were acceptable, the model was accepted. The scalar invariance model had good fit and was not rejected. The strict invariance model revealed acceptable criteria and was not rejected. There was full strict invariance, as all factor loadings, thresholds, and unique variance were invariant across the *living arrangement* groups.

< Insert Table 7 here >

DISCUSSION

The purpose of the present research was to explore the psychometric properties of the French version of the MACA-YC18 in a general population of adolescents, and for the first time, in a population of young adults. Moreover, the originality of this research is that we examined the construct validity of several characteristics associated with caregiving. Through two studies, one on adolescents and one on young adults, our results highlight the good psychometric properties of the MACA-YC18.

For both studies, the factor analysis confirmed a 6-factor structure as in the original version. The MACA-YC18 measures six dimensions: *domestic chores*, *household management*, *financial/practical help*, *personal care*, *emotional care*, and *sibling care*. The internal consistency, using Cronbach's alpha and McDonald's omega criteria, revealed similar results in Study 1 and Study 2. In line with previous studies (Järkestig-Berggren et al., 2019; Joseph, Becker, Becker, et al., 2009), the total score and three dimensions (i.e., *personal care*, *emotional care*, *sibling care*) presented high internal consistencies, whereas the other three dimensions (i.e., *domestic chores*, *household management*, *financial/practical help*) had poorer ones. These dimensions are conceptualized as having several different aspects of caring activities. It could be presumed that 3 items per dimension is not enough to ensure a

high reliability between specific caring activities such as cleaning, cooking, or shopping. To improve the MACA-YC18, it could be useful to propose a revised version including more items in these dimensions. However, adding items may lead to a misleading impression of homogeneity especially if items are sharing similar wording (Streiner, 2003). Items then have to be chosen in purpose. In its current state, these dimensions should thus be used with caution regarding each item scores. More research is needed to improve the assessment of these caring activities. It is worth noting that in both studies, and contrary to that of Joseph, Becker, Becker, et al. (2009), all dimensions of the MACA-YC18 are significantly interrelated. This finding highlight that all dimensions share a common variance and that using a total score to measure the extent of caring activities is relevant. To go further, future research should investigate a potential hierarchical structure of the MACA-YC18 with a higher order factor especially as the total score presented high reliability in both samples. Such a perspective would strengthen the use of a total score.

In addition, in study 1 among adolescents, invariance measurement was tested according to the *gender*, *sick/disabled relatives, types of illness/disability,* and *providing support* groups. Our findings demonstrate strict invariance for each variable, as the factor loadings, thresholds, and unique variance appeared invariant across groups. The MACA-YC18 can therefore be used for comparing groups among adolescents. Complementarily, in study 2 among young adults, the results of the invariance measurement also showed strict invariance across the *gender, sick/disabled relatives*, *providing support,* and *living arrangement* groups. As in the sample of adolescents, the MACA-YC18 could be used to compare young adult groups. Overall, both studies show that the MACA-YC18 items are understood in the same way across groups. These findings shed additional light on the usefulness of the MACA-YC for identifying and characterizing YC and YAC within the

general population. In line with the recent work of Joseph et al. (2019), our results suggest that the MACA-YC can be a relevant screening tool.

The strength of this research is that the findings underscore the usefulness of the MACA-YC18 for adolescents and young adults. Specifically, for young adults, they show that the "do not concern me" modality within the item scoring leads to better coping with young adults' living arrangements. They highlight the fact that a scale developed for children and adolescents does not suit all young people, and should be adapted for young adults. Nevertheless, this research has some limitations. First, to further support our results, it would be interesting to investigate the construct validity of the MACA-YC18 among early adolescents and young adult workers or NEET (i.e., young adults who are not in employment, education, or training). Second, although construct validity was demonstrated, other psychometric properties have not been tested. It would be interesting to investigate convergent validity as for the original version regarding the number of hours of caring and the number of school days missed (Joseph, Becker, Becker, et al., 2009). Besides, YC and YAC have been recognized in many different countries (Becker, 2007). Becker and Sempik (2019) argued that although YC have the same role from country to country, the type of tasks they perform may vary. Future research should therefore investigate the invariance of structure of the MACA-YC18 considering different countries.

In conclusion, the French version of the MACA-YC18 had good psychometric properties regarding construct validity, although three dimensions should be used with caution because of their low internal consistencies (*domestic chores*, *household management*, *financial/practical help*). This adaptation can therefore be used for investigating the extent and nature of caring activities in the general population within adolescence and young adulthood. The MACA-YC18 allows comparison across sociodemographic variables and

characteristics related to illness and disability. The MACA-YC18 can be a relevant screening tool that enables the identification of YC as well as YAC.

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Table 1
Versions, population characteristics, and internal consistencies of the MACA-YC18 in previous studies.

	Version	Age (years)	Population	Internal consistencies (α)
Joseph et al. (2009)	English (original version)	Study 1: 6.5–22 Study 2: 8–21	Young carers	Domestic chores: .64 Household management: .57 Financial/practical help: .45 Personal care: .91 Emotional care: .64 Sibling care: .70 Total score: .78
Sempik & Becker (2014)	English	14–25	Young carers	-
Kavanaugh (2014)	English	12–20	Young carers	-
Mechling (2015)	English	18–25	General population	Total score: .78
Kallander, Weimand, Becker, et al. (2018)	Norwegian	8–17	Sick relative	Total score: .70 with an additional sub-scale from the MACA-YC 42
Kallander, Weimand, Ruud, et al. (2018)	Norwegian	8–18	Sick relative	Total score: .70 with an additional sub-scale from the MACA-YC 42
Joseph et al. (2019)	English (adaptation of seven items)	11–15	General population	-
Järkestig-Berggren et al. (2019)	Swedish	10–18	Young carers	Domestic chores: .60 Household management: .65 Financial/practical help: .59 Personal care: .89 Emotional care: .70 Sibling care: .76 Total score: .78
Becker & Sempik (2019)	English	14–25	Young carers	-
Leu et al. (2019)	German, French, Italian	9–16	General population	Total score: .79

Note. α: Cronbach's alpha.

Table 2
Sociodemographic characteristics of the adolescent sample (N = 2,688).

	Total sample
Girls gender, *N* (%)	1,629 (61.52)
Age, *M* (*SD*)	16.08 (0.98)
Grade, *N* (%)	
10	1,279 (47.67)
11	598 (22.28)
12	815 (30.37)
Having sibling, *N* (%)	2,514 (93.53)
Living arrangement, *N* (%)	
With parents	2,578 (96.08)
Not with parents	108 (3.92)
Having a sick/disabled relative, *N* (%)	711 (26.45)
Relative's type of illness/disability, *N* (%)	
Physical illness	295 (41.49)
Mental illness	139 (19.55)
Other illness or disability	277 (38.96)
Providing support to a sick/disabled relative, *N* (%)	406 (15.12)

Table 3

Descriptive statistics, internal consistency, and bivariate correlations of the dimensions and total score of the MACA-YC18 in the adolescent and young adult samples.

	M	*SD*	α [95CI%]	Ω	Range	2	3	4	5	6	7
Adolescent sample *(N = 2,688)*											
1. Domestic chores	3.59	1.29	.45 [.41-.48]	.47	0-6	.28***	.19***	.24***	.23***	.25***	.55***
2. Household management	2.64	1.39	.42 [.38-.45]	.43	0-6		.31***	.17***	.26***	.18***	.56***
3. Financial/practical help	0.66	1.12	.52 [.49-.55]	.57	0-6			.25***	.26***	.19***	.48***
4. Personal care	0.62	1.39	.89 [.88-.90]	.89	0-6				.43***	.44***	.59***
5. Emotional care	2.07	1.87	.78 [.76-.79]	.79	0-6					.35***	.72***
6. Sibling care	1.92	2.05	.84 [.83-.85]	.85	0-6						.69***
7. Total score	11.51	5.87	.82 [.81-.83]	.86	0-36						
Young adult sample *(N = 1,192)*											
1. Domestic chores	3.71	1.18	.44 [.38-.49]	.48	0-6	.10***	.13***	.14***	.16***	.16***	.94***
2. Household management	2.32	148	.44 [.37-.48]	.47	0-6		.28***	.18***	.13***	.15***	.13***
3. Financial/practical help	1.24	1.40	.42 [.36-.47]	.46	0-6			.39***	.17***	.21***	.16***
4. Personal care	0.41	1.17	.87 [.86-.88]	.88	0-6				.22***	.21***	.16***
5. Emotional care	1.65	1.90	.81 [.79-.83]	.82	0-6					.40***	.19***
6. Sibling care	0.91	1.61	.83 [.81-.85]	.85	0-6						.19***
7. Total score	10.27	5.30	.78 [.76-.80]	.84	0-36						

Note. α: Cronbach's alpha; Ω: McDonald's omega. ***$p < .001$.

Table 4
Confirmatory factor analysis of the 6-factor models in the adolescent and young adult samples.

	N	χ^2	*df*	RMSEA [90CI%]	CFI	TLI	WRMR
Adolescent sample *(N = 2,688)*							
Whole sample	2,688	411.02	120	.030 [.027-.033]	.99	.99	1.22
Gender							
Girls	1,629	286.77	120	.029 [.025-.034]	.99	.99	1.01
Boys	1,019	251.94	120	.033 [.027-.039]	.98	.98	0.97
Having a sick/disabled relative							
Having a sick/disabled relative	711	219.83	120	.034 [.027-.041]	.99	.99	0.89
Not having a sick/disabled relative	1,977	311.19	120	.028 [.025-.032]	.99	.99	1.52
Type of illness/disability							
Physical illness	295	169.77	120	.038 [.023-.050]	.99	.98	0.77
Mental illness	139	149.71	120	.042 [.012-.063]	.98	.97	0.80
Other illnesses/disabilities	277	153.42	120	.032 [.013-.046]	.99	.99	0.73
Providing support							
Providing support to a sick/disabled relative	406	186.38	120	.037 [.026-.047]	.99	.98	0.83
Not providing support	2,279	338.62	120	.028 [.025-.032]	.99	.99	1.10
Young adult sample *(N = 1,192)*							
Whole sample	1,192	447.97	120	.048 [.043-.053]	.97	.98	1.36
Gender							
Girls	933	371.86	120	.047 [.042-.053]	.98	.97	1.23
Boys	259	176.83	120	.043 [.029-.056]	.98	.97	0.88
Having a sick/disabled relative							
Having a sick/disabled relative	725	255.50	120	.039 [.033-.046]	.98	.98	1.01
Not having a sick/disabled relative	467	314.93	120	.059 [.051-.067]	.95	.94	1.52
Providing support							
Providing support to a sick/disabled relative	318	183.31	120	.041 [.028-.052]	.98	.98	0.85
Not providing support	874	367.25	120	.491 [.043-.054]	.97	.96	1.26
Living arrangement							
Living with the family	689	279.76	120	0.44 [.037-.051]	.98	.97	1.56
Not living with the family	479	277.47	120	0.43 [.035-.052]	.98	.97	1.00

Table 5
Multiple-group confirmatory factor analysis models for measurement invariance in the adolescent sample (N = 2,688).

	χ^2	*df*	RMSEA [90CI%] (Δ)	CFI (Δ)	*p*
Girls vs. boys					
Configural invariance	370.31	240	.031 [.027-.034]	.992	-
Metric invariance	433.58	252	.030 [.027-.034] (.001)	.991 (.001)	*
Scalar invariance	659.32	264	.039 [.036-.045] (.009)	.985 (.006)	***
Strict invariance	659.32	282	.039 [.036-.042] (.000)	.985 (.000)	.99
Having a sick/disabled relative vs. not having one					
Configural invariance	359.46	240	.030 [.026-.033]	.993	-
Metric invariance	389.91	252	.028 [.024-.031] (.002)	.993 (.000)	.65
Scalar invariance	419.05	264	.027 [.023-.030] (.001)	.993 (.000)	*
Strict invariance	419.05	282	.027 [.036-.042] (.001)	.993 (.000)	.99
Relative with physical illness vs. mental illness vs. other illnesses/disabilities					
Configural invariance	333.36	240	.036 [.026-.044]	.989	-
Metric invariance	395.92	252	.035 [.026-.044] (.001)	.989 (.000)	.73
Scalar invariance	430.54	264	.033 [.023-.042] (.002)	.989 (.000)	.76
Strict invariance	430.54	282	.032 [.023-.041] (.001)	.989 (.000)	.99
Providing support to a sick/disabled relative vs. not providing support					
Configural invariance	360.35	240	.029 [.026-.032]	.993	-
Metric invariance	393.53	252	.027 [.023-.030] (.002)	.994 (.001)	.66
Scalar invariance	432.96	264	.027 [.024-.030] (.000)	.993 (.000)	**
Strict invariance	432.96	282	.027 [.023- .030] (.000)	.993 (.000)	.99

Note. *$p < .05$. **$p < .01$. ***$p < .001$.

Table 6
Sociodemographic characteristics of the young adult sample (N = 1,192).

	Total sample
Girls gender, *N* (%)	933 (78.28)
Age, *M* (*SD*)	20.52 (1.89)
Grade, *N* (%)	
First-year	293 (24.58)
Second-year	282 (23.66)
Third-year	356 (19.87)
Fourth-year	139 (11.66)
Fifth-year	97 (8.14)
Sixth-year	25 (2.10)
Curricula, *N* (%)	
Literature, art, and human sciences	525 (48.61)
Law and economics	237 (21.94)
Sciences and technology	164 (15.18)
Medicine school	94 (8.70)
Engineer sciences	47 (4.35)
School-teaching studies	14 (1.30)
Having sibling, *N* (%)	1,047 (89.33)
Living arrangement, *N* (%)	
With parents	689 (58.99)
Not with parents	479 (41.01)
Alone in a rental accommodation	219 (45.72)
With a partner in a rental accommodation	79 (16.49)
Shared accommodation	89 (18.58)
Social housing	92 (19.21)
Having a sick/disabled relative, *N* (%)	725 (60.82)
Relative's type of illness/disability, *N* (%)	
Physical illness	699 (73.50)
Mental illness	196 (20.61)
Other illness and disability	56 (5.89)
Providing support to a sick/disabled relative, *N* (%)	318 (26.68)

Table 7
Multiple-group confirmatory factor analysis models for measurement invariance in the young adult sample (N = 1,192).

	χ^2	*df*	RMSEA [90CI%] (Δ)	CFI (Δ)	*p*
Girls vs. boys					
Configural invariance	431.50	240	.044 [.039-.049]	.978	-
Metric invariance	451.17	252	.041 [.036-.047] (.003)	.980 (.002)	.84
Scalar invariance	515.45	264	.043 [.038-.048] (.002)	.977 (.003)	***
Strict invariance	515.45	282	.042 [.037-.047] (.001)	.976 (.001)	.99
Having a sick/disabled relative vs. not having one					
Configural invariance	445.23	240	.048 [.043-.053]	.973	-
Metric invariance	492.02	252	.047 [.042-.052] (.001)	.972 (.001)	.09
Scalar invariance	519.16	264	.046 [.041-.051] (.001)	.972 (.000)	.06
Strict invariance	519.16	282	.046 [.041-.050] (.000)	.971 (.001)	.99
Providing support to a sick/disabled relative vs. not providing support					
Configural invariance	436.14	240	.046 [.041-.051]	.973	-
Metric invariance	456.28	252	.044 [.039-.049] (.002)	.975 (.002)	.76
Scalar invariance	479.58	264	.042 [.037-.047] (.002)	.975 (.000)	.20
Strict invariance	479.58	282	.042 [.037-.047] (.000)	.974 (.001)	.99
Living with the family vs. not					
Configural invariance	388.43	240	.044 [.038-.049]	.980	-
Metric invariance	399.41	252	.040 [.034-.045] (.004)	.982 (.002)	.98
Scalar invariance	505.59	264	.045 [.040-.050] (.005)	.976 (.006)	***
Strict invariance	505.59	282	.045 [.040-.049] (.000)	.975 (.001)	.99

Note. *$p < .05$.

APPENDIX 1: ITEMS OF THE FRENCH VERSION OF THE MACA-YC18

1. Ranger votre chambre
2. Ranger une autre chambre
3. Faire la vaisselle et remplir ou vider le lave-vaisselle
4. Faire des rénovations (par exemple repeindre des murs, accrocher des cadres, poser du papier-peint)
5. Prendre la responsabilité pour les achats de produits alimentaires (pour la famille)
6. Aider à lever et à porter des charges lourdes
7. Aider à payer les factures, à virer de l'argent ou à remplir des formulaires pour les administrations
8. Gagner de l'argent parallèlement à vos études pour aider la famille
9. Aider pour les traductions (par ex. lors des visites chez le médecin, dans les administrations)
10. Aider à l'habillage et au déshabillage d'une personne
11. Aider quelqu'un à se laver (les mains et le visage)
12. Aider quelqu'un à prendre sa douche ou son bain
13. Tenir compagnie à quelqu'un (par exemple pour rester ensemble, faire la lecture, faire la conversation)
14. S'assurer que tout est bien OK pour la personne dont vous vous occupez
15. Accompagner la personne dont vous vous occupez (par exemple pour rendre visite à des amis ou à de la famille, pour faire une promenade)
16. Accompagner vos frères et sœurs à l'école, à la garderie, etc.
17. Surveiller vos frères et sœurs alors qu'un autre adulte est dans les environs
18. Faire attention tout(e) seul(e) à vos frères et sœurs

Rating scale: 0 = Never, 1 = Some of the time, 2 = A lot of time, 0 = Does not concern me

Domestic chores: Items 1, 2, 3
Household management: Items 4, 5, 6
Financial/practical help: Items 7, 8, 9
Personal care: Items 10, 11, 12
Emotional care: Items 13, 14, 15
Sibling care: Items 16, 17, 18