



Extracurricular activities as a way to foster development for youth living in an extreme context: a basic psychological needs perspective in Madagascar.

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13 ABSTRACT

14 Numerous studies have highlighted the links between involvement in extracurricular activities
15 and positive outcomes for youth. Nevertheless, studies documenting those links have been
16 conducted primarily in the global North. Little is known about the effect of participating in
17 extracurricular activities for youth developing in extreme contexts (i.e. extreme poverty, refugee
18 camps, conflicted areas, areas affected by climate changes, sexual exploitation or child
19 soldiers). This research is testing if the participation in extracurricular activities of youth (N=96;
20 Mage= 15.07) developing in an extreme context had an effect over time on their psychological
21 well-being as well as the satisfaction and frustration of their basic psychological needs
22 (autonomy, competence and relatedness). Youth were recruited through a partnership with a
23 local NGO in southern Madagascar, which offers art and sports activities. A control group was
24 recruited in a neighboring public school. Participants had never participated in NGO's
25 extracurricular activities before entering the study. Four data collection sessions were carried
26 out over a span of 16 months. 96 participants engaged throughout the four data collection
27 sessions. Mixed factorial Analyses of Variance were employed to test the objective. Results
28 show that participation in extracurricular activities for youth developing in an extreme context
29 had positive effects on the satisfaction of the need for autonomy ($p=.037$) and on the
30 frustration of the basic psychological needs overall ($p=.019$). Also, the study results show that
31 there was a protective effect of participating in extracurricular activities against the decrease of
32 the needs' satisfaction as this reduction was observed in the control group ($p=.038$) and not in
33 the youth involved in extracurricular activities. Participation in art, music and sport
34 extracurricular activities seems to have positive outcomes for youth living in an extreme
35 context of development.

36

37 Keywords

38 Youth, Extreme context, Madagascar, Extracurricular activities, Art, Sport

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40

41 1. INTRODUCTION

42 The world's population is composed of approximately 1.8 billion human beings aged
43 between 10 and 24 years old. About 90% of this young generation live in the Global South¹
44 (Farley & Robitaille, 2023), where living conditions are likely to be extreme. Indeed, the
45 contemporary context of many children's lives echoes extreme development conditions:
46 children living in conditions of extreme poverty, child soldiers, children living in the street, in
47 refugee camps, in conflicted areas, children working in mines, in garbage dumps, as domestic
48 servants, sexually exploited or living in areas affected by climate changes. Such conditions are
49 likely to threaten the development and well-being of these young people by imposing
50 additional layers of challenges on them.

51 Many programs aiming at education, food or health to optimize youth development and
52 promote their well-being are developed all over the world. Amongst them, extracurricular
53 activities are said to be a promising avenue (Jalloh, 2013). A growing body of literature
54 demonstrates the positive influence of participation in extracurricular activities on the
55 development and well-being of youth. Participation in extracurricular activities seems to be
56 positively related to positive outcomes, as observed with school well-being and academic
57 achievements (Fredricks & Eccles, 2006), lower levels of depressive mood and anxiety (Larson
58 et al., 2002) as well as lower levels of aggression, antisocial behavior, and crime (Mahoney et al.,
59 2005), or risky behaviors (Boelens et al., 2022; Farb & Matjasko, 2012). Researchers have shown
60 that the satisfaction of basic psychological needs (BPN) (Ryan & Deci, 2000) in an extracurricular
61 activity context seem to promote the need for competence and relatedness, and a more
62 general well-being among adolescents (Leversen et al., 2012).

63 Studies documenting the link between extracurricular activities and these positive
64 outcomes have been conducted primarily in the Global North. This corpus of research
65 represents only some contexts in which a minority of young people evolve. So far, little seems
66 to be known on the efficacy of these programs for the majority of the world's youth population
67 who live in a context of development that may be considered extreme (Henrich et al., 2010).
68 Yet, in its World Programme of Action for Youth (2010), the United Nations (UN) emphasizes the
69 universal aspect of recreation to foster youth development, like psychological, cognitive and
70 physical capacities, in all societies. As the UN intends to build on recreational programs to meet
71 the seventeen sustainable development goals (SDG) endorsed by its member states, it is crucial
72 to understand how extracurricular activities impact the young generation living in various
73 contexts. In this research, we intend to begin filling this gap of knowledge by studying the
74 influence of participation in extracurricular activities on youth developing in an extreme context
75 of development.

77 1.1. *Extreme context of development: Madagascar*

78 The concept of extreme context of development refers to conditions in which people

¹ Recognizing the contested nature of the concepts, the authors of this text chose to use the concepts of the Global South and Global North in this writing as general terms to distinguish the more or less economically stable regions of the world.

79 are facing several related factors, like malnutrition, arduous work, lack and deprivation of
80 freedom, lack of access to health care, insecurity, and lack of basic resources (Bettelheim,
81 1943). Our research takes place in a context that may be considered as extreme in terms of
82 development, in the region of Toliara, in the south-west of Madagascar. The country has an
83 estimated population of 28 million. In 2021, 39.82% of the population was aged under 15 years
84 old (O'Neill, 2022). Madagascar is recognised as one of the poorest countries in the world.
85 From the United Nations Development Program (UNDP) report on human development,
86 Madagascar is ranked 173th out of 189 countries on the Human Development Index (UNDP,
87 2022). Compared to sub-Saharan African countries, Madagascar's development improvement is
88 significantly slower (World Bank, 2022). Up to 80% of the Malagasy population lives in extreme
89 poverty, with less than US\$1.90 per day (World Bank, 2022). While the central plateau and
90 north-east of Madagascar have relatively lower poverty rates, the proportion of poor children,
91 at 49.3%, is the highest in the south and west of Madagascar, including the Toliara region
92 where this study was performed (Silva-Leander, 2020). Due to this extreme poverty and lack of
93 basic resources, children may be entrusted to extended family members like grandparents,
94 uncles, aunts or cousins. To increase family income, children are often put to work: 28% of
95 Malagasy children aged 5 to 17 are working (UNICEF, 2018). In Madagascar, children's work
96 varies from selling goods in the street or souvenirs to tourists, to working in salt or sapphire
97 mines, or even resorting to prostitution to support the family or even survive. Poverty and child
98 labour impact on school enrolment: nearly one million children aged 6 to 10 do not attend
99 school. In 2012, the school enrolment rate was 69% and had fallen drastically compared to
100 2005 when a rate of 83% was observed (UNICEF, 2018).

101 The difficulties faced by Madagascar and its population are related to political and
102 climatic issues. Frequent political crises, as well as cyclones and floods that affect the country
103 three to four times a year, impact its economic development (World Bank, 2022). Drought
104 recurrently affects the south of the island and threatens the country's food security. Due to
105 climate change, cyclones, floods and droughts are likely to intensify in the coming years.
106 According to a report from the UN's World Food Program (2022), food insecurity already affects
107 33% of the population in the South of the country. The country's health situation is worrying,
108 with the resurgence of diseases such as plague and malaria, as well as the persistence of
109 tuberculosis and measles due to a lack of vaccination among children (United Nations
110 Population Fund, 2017). Moreover, the COVID-19 pandemic has also had a profound and
111 devastating effect on the population (World Bank, 2020). In, 2018, only 6% of the national
112 budget was allocated to the ministry of health (UNICEF, 2018). Inequality issues are particularly
113 prominent among young women, for which access to health services is even more difficult.
114 According to a UNICEF (2018) report, lack of household resources, providers and control over
115 women, hinders women's access to public health services. At the same time, sex education is
116 sparse, limited and early pregnancy rates are high: in Madagascar, 37% of pregnancies are
117 among young women aged 15-19 in 2012 (UNICEF, 2018). The contraceptive prevalence rate is
118 33% and only 5.6% in the south of the country (United Nations Population Fund, 2017), given
119 that teenage pregnancies account for a third of maternal deaths in the country (UNICEF, 2018).
120 The low rate of contraceptive use also echoes the intensification of young girls' vulnerability,
121 particularly from a financial perspective.

122 In brief, malnutrition among Malagasy children, extreme poverty that prevents the
123 population from accessing basic resources and the lack of access to healthcare are indicators
124 of the extreme context of development. Those elements are reinforced by child labour coupled
125 with the insecurity it engenders and the arduousness of the tasks, as well as the infringement
126 of children's rights, particularly in terms of protection and education. Based on these various
127 elements Madagascar can be considered an extreme context of development for many young
128 people. Such extreme contexts limit the possibilities of optimal development by imposing
129 multiple challenges on children. Furthermore, the combination of different simultaneous
130 factors will heighten the vulnerability of children, posing a threat to their well-being and
131 potentially being disadvantaged (Silva-Leander, 2020).

132 **1.2. Well-being and basic psychological needs (BPN)**

134 In 2015, the UN chose to continue its commitment to global development through
135 2030, proposing 17 Sustainable Development Goals (SDGs) as international guidelines for its
136 member states. One of the targeted areas concerns health and well-being (SDG 3) and aims to
137 "ensure healthy lives and promote well-being for all at all ages" (United Nations, 2020). As
138 defined by the World Health Organization (1946), health is not only the absence of disease or
139 infirmity, but also "a state of complete physical, mental and social well-being". The mental and
140 social components are too often forgotten when it comes to the question of health and well-
141 being, and even more in extreme contexts, when the priorities focus mainly on food, access to
142 water or basic resources. Far from us to minimize the problems of fulfillment of basic physical
143 needs, research has highlighted the importance of fulfilling basic psychological needs (BPN) to
144 reach well-being and optimal development (Ryan & Deci, 2000). Chen and colleagues (2015a)
145 examined if the link between BPN and well-being was constrained by the satisfaction of the
146 need for environmental and financial safety in a South African young adults' sample and in a
147 Chinese adults' sample. The researchers found, in both samples, that the satisfaction of the
148 BPN contributed to well-being more than safety satisfaction, at every level of safety satisfaction.

149 Basic Psychological Needs Theory is one of the six mini-theories of the Self-
150 Determination Theory (SDT; Ryan & Deci, 2000). It supports the assumption that the
151 satisfaction of three fundamental psychological needs — relatedness, competence, and
152 autonomy — would promote well-being, psychological health and growth. The frustration of
153 these needs would cause defensiveness, psychological insecurity, ill-being, and mental health
154 problems (Ryan & Deci, 2000; Vansteenkiste & Ryan, 2013). Numerous studies have established
155 the relation between BPN satisfaction and an array of well-being outcomes, for instance vitality
156 (Ryan et al., 2010), life satisfaction (Levensen et al., 2012), self-esteem (Moller et al., 2006) or ill-
157 being outcomes, namely depression (Cordeiro et al., 2016). These results were obtained across
158 a variety of life domains, including parenting, education, work, health care, psychotherapy as
159 well as leisure or extracurricular activities (for a review see Ryan & Deci, 2017)

160 According to SDT, autonomy refers to the need for individuals to voluntarily decide for
161 themselves about their experiences and actions (Ryan & Deci, 2000). Autonomy implies that a
162 person's behaviors are endorsed, associated with a sense of volition and are congruent with his
163 or her "self", interests and values, as opposed to feelings of pressure or coercion to act or think
164 in certain ways (Ryan & Deci, 2017). Competence implies a person's fundamental need to

165 exercise his or her abilities, feel effective in his or her interactions with the environment, and to
166 meet challenges appropriate to his or her level of competence (Ryan & Deci, 2000) rather than
167 experiencing inferiority or inadequacy feelings (Chen et al., 2015a). The need for competence is
168 manifested at an early age through children's expressions of curiosity and the need to
169 manipulate objects around them (Ryan & Deci, 2017). Relatedness is manifested in a person's
170 need to feel socially connected in a meaningful way, rather than feeling lonely and alienated. A
171 person will feel more connected to others if they care about them and their well-being, and if
172 they feel they belong and are meaningful within their group. Relatedness can also be
173 manifested through an individual's care for others or his or her contribution to the well-being
174 of others (Ryan & Deci, 2017).

175 According to SDT, the BPN are universal and independent of developmental level or
176 cultural setting (Ryan & Deci, 2017). However, how these needs are expressed and met may
177 vary from one culture to another (La Guardia & Ryan, 2000). This assumption is contradicted by
178 other schools of thought, like cultural relativism, in which the content and structure of the self
179 can differ considerably depending on the culture (Markus & Kitayama, 1991). The need for
180 autonomy is often subject to criticism, being seen as a concept that aligns more closely with
181 more individualistic cultures prevalent in North America, Western Europe, and Australia, as
182 opposed to the more collectivist cultures found in Asia, South America, Africa, and indigenous
183 societies. Despite this, Malagasy culture, largely owing to its insular nature (Triandis, 2006), is
184 more inclined towards the collectivist end of the spectrum (Dahl, 1999). However, it's important
185 to note that Malagasy culture is not uniformly collectivistic, as pointed out by Radanielina-Hita
186 (2010). This variability may be attributed to factors such as the use of second or third languages
187 (French and/or English) and the influence of cultural shifts and, to some extent, Westernization
188 due to French colonization. The confusion between the concept of autonomy and
189 independence might be at the source of criticism. As explained, autonomy refers to the self,
190 whilst independence refers to the outside world. Independence means that the individual is
191 not dependent on something or someone (Chirkov et al., 2003). For SDT, a person can be both
192 autonomous and dependent (Ryan & Deci, 2017), such as a child who depends on a parent, but
193 whose parent seeks to foster his or her autonomy by providing a certain level of choices. The
194 validity of the BPN model has been tested within different cultures in numerous studies, all of
195 which affirm its credibility (Chen et al., 2015a; Chen et al., 2015b; Chirkov et al., 2003). Even
196 though these needs may not be equally supported in all cultures (Chirkov et al., 2003), their
197 neglect has negative impacts on a person's development, well-being, and integrity regardless of
198 cultural context (La Guardia & Ryan, 2000).

199

200 **1.3. Extracurricular activities and well-being**

201 Extracurricular activities are envisaged as organized activities, as opposed to so-called
202 unstructured activities, in which youth could spend time after-school watching television,
203 listening to music, hanging out with peers, resting, etc. (Mahoney et al., 2005). Organized
204 activities involve a regular schedule, integration into a peer group, are supervised by adults, are
205 generally voluntary, focus on the acquisition of specific skills, encourage positive youth
206 development and are not part of the school curriculum (Bohnert et al., 2010; Mahoney et al.,
207 2005). Non-exhaustive examples of organized activities include sport (e.g., rugby, basketball,

208 karate), arts (e.g., dance, theater, music group/lesson) or community programs (e.g., scouts)
209 (Hansen et al., 2003). Participation in activities is usually operationalised in terms of the number
210 of activities in which a young person participates or in terms of intensity, for example the
211 number of hours spent in the activity over a period of time (Denault & Poulin, 2009).

212 As a way of promoting health, positive psychology has encouraged research to inquire
213 about the way in which certain events in daily life, like extracurricular activities, may promote
214 well-being (Freire, 2018). Numerous studies in the Global North have highlighted the link
215 between participating in extracurricular activities and positive outcomes in youth. Literature
216 reviews have highlighted the benefits of extracurricular activities on outcomes as extensive as
217 education attainment, diminution of risky behaviors like substance abuse, delinquency or
218 unprotected sex, enhanced psychosocial competencies, and well-being (Boelens et al., 2022;
219 Bohnert et al., 2010; Farb & Matjasko, 2012). Extracurricular activities can be seen as
220 opportunities for extraordinary additional and enriched experiences that may optimize
221 adolescents' development (Horowitz, 2000). Contrasting research results have reported that
222 bullying and engaging in risky behavior are potential harmful consequences of extracurricular
223 activities (Matjasko et al., 2019). The amount of time spent in the activity seems to influence
224 these results, with the hypothesis that too many hours spent in extracurricular activities could
225 have a detrimental effect on youth (Matjasko et al., 2019).

226 In a systematic literature review in the US, Heath and colleagues (2018) reported that
227 gender and socio-economic status (SES) can influence the impact of participating in
228 extracurricular activities on a wide range of academic, social and psychological outcomes.
229 Youth seem to orient themselves towards activities that are presented as typical for their
230 gender² (sport as male activities and art or music lessons and youth clubs as female activities),
231 even though activities considered as gender atypical (female youth interested in team sport
232 and male youth in dance lessons) may have greater benefits (Heath et al., 2018). Regarding SES,
233 studies have shown that youth with lower socio-economic background benefit more from
234 extracurricular activities than their peers with higher SES (Heath et al., 2018). Yet, youth with
235 lower SES are the ones who participate less in extracurricular activities (Bouffard et al., 2006).

236 From a SDT perspective, extracurricular activities represent a domain in life where BPN
237 can be satisfied. In this context, despite the influence of social and cultural values and the
238 availability of opportunities, extracurricular activities offer young individuals the chance to be
239 challenged, enhance their skills, and be good at something (competence). These activities are
240 typically chosen voluntarily, allowing for personal choice that aligns with one's interests
241 (autonomy). Additionally, these activities provide opportunities to interact with peers who share
242 similar interests, fostering the sharing of experiences and the development or strengthening of
243 friendships (relatedness) (Leveresen et al., 2012).

244 We perceive extracurricular activities as an opportunity to optimize youth development,
245 and not just to avoid negative consequences. Extracurricular activities may be considered as a
246 protective factor that might buffer or compensate for risks but also as a way to thrive (Lerner et
247 al., 2015). Studies on the positive links between extracurricular activities and well-being or

² Although the authors recognize gender as a multidimensional construct, so far literature in this field of research reports gender identities in terms of male and female.

248 optimal development, have been conducted mainly in certain regions of the world (e.g.,
249 Canada, Northern Europe, United States of America, Australia, etc.). Research conducted in
250 contexts described as extreme in terms of development is rare in the scientific literature. Yet,
251 conditions in which youth are developing in different regions of the world can drastically vary
252 and implicate different challenges, as we made the case in this paper for Madagascar.
253 Programs that are developed by local organizations or international agencies could benefit
254 from data on the effects of these activities on target populations to support decision making,
255 program development, and funding.
256

257 **2. OBJECTIVE AND HYPOTHESES**

258 Therefore, after verifying the applicability of the BPN framework in a Malagasy context
259 with a youth population (O1), the main objective of this research is to measure the evolution of
260 the well-being as well as the satisfaction and frustration of the basic psychological needs of
261 youth participating in extracurricular activities in an extreme context of development (O2).

262 We hypothesize that the general proposition of the BPN mini theory (Ryan & Deci,
263 2017), stating that the satisfaction of the three BPN is associated with well-being, whilst need's
264 frustration is associated with greater ill-being, will be respected in our sample (H1). We posit
265 that participation in extracurricular activities, both art and sport, promotes the psychological
266 well-being of participating youth and the satisfaction of their three basic psychological needs,
267 considered individually (H2). We also think that the satisfaction of the needs, considered as a
268 whole, changes positively over time for youth who participate in extracurricular activities (H3).
269 Finally, we hypothesize that the frustration of the needs, considered as a whole, diminishes
270 over time for youth who participate in extracurricular activities (H4).
271

272 **3. METHODS**

273 The world's

274

275 **3.1. Study design/research approach**

276 This study is part of a larger collaborative mixed methods research project on the
277 participation in extracurricular activities of youth developing in an extreme context. This research
278 is aligned with the needs of the Malagasy NGO who collaborate with researchers from the
279 Université A and Université B to complete this project (Author 1 et al., In Press; Author 6 et al.,
280 2021).

281 In this study, two types of organised activities are examined: artistic activities (percussion
282 group, a marching band, a capoeira group, a circus group, a guitar group) and sports activities
283 (soccer and basketball groups) (Mahoney et al., 2005). Artistic and sport activities are the two
284 types of activities offered by the partner NGO. The choice of studying these activities is based on
285 the existing literature that highlights the potential of sports and art-music activities for
286 development (Gadais et al., 2023; Venkatesh et al., 2023). These activities take place at a fixed
287 time and on fixed days of the week. Youths meet twice a week for one and half to two hours per
288 session. They are supervised by adults and are collective. They aim at the positive development

289 of young people and the acquisition of artistic, sporting and social skills. To measure the impact
290 over time of extracurricular Art and Sport programs on the psychological well-being and the
291 satisfaction and frustration of the BPN of the youth of Toliara, we collected quantitative data via
292 questionnaires with youth involved in extracurricular activities proposed by NGO.

293

294 **3.2. Sample and procedure**

295 Youth involved in Art or Sport activities offered by the NGO were invited to participate in
296 this project. The research team, accompanied by the supervisors of the NGO' activities, went to
297 the first session of the activity to offer them to participate in the study. Simultaneously, a group
298 of youth not involved in the NGO activities was recruited in a public school in Toliara, as a
299 control group. With the collaboration of the school staff, researchers went to classes and
300 offered the students to complete the questionnaires. Participants completed questionnaires
301 four times over the course of 16 months, starting from February 2020 (T1), then November
302 2020 (T2), March 2021 (T3) and June 2021 (T4)³. Participants had never participated in NGO's
303 extracurricular activities before answering the questionnaires at the first measurement time. All
304 the participants were aged from 14 to 18 years old⁴. At T1, we recruited 262 participants in
305 total. During 16 months of involvement in the activities, 96 participants engaged throughout
306 the four data collection sessions. The experimental group was split into two subgroups, the art
307 group and the sport group, that were each composed of 25 participants (art, 28% self-identified
308 as female; sport, 48% self-identified as female). The control group had 46 participants (45%
309 self-identified as female). Young people had a choice of different disciplines in art and sport.
310 Participants chose for themselves in which activity they wish to get involved. In the art group,
311 participants were involved either in a marching band (36%), a capoeira group (20%), a
312 percussion group (16%), a circus group (16%), or in a guitar group (12%). In the sport group,
313 participants were involved in a soccer group (64%) or a basketball group (36%).

314

315 **3.3. Measures**

316 All questionnaires were administered in Malagasy. Original English versions were
317 translated into official Malagasy. Following the method suggested by Vallerand (1989),
318 translations from English to Malagasy, and back-translations, were carried out by professional
319 translators. Translations and back-translations were then compared by a committee of
320 Malagasy psychologists and linguists. The back-translations were compared with the original
321 versions, and the Malagasy translation was adjusted according to the semantic shifts between
322 the two versions. The Country has several different dialects, so we chose to use the official

³Data were mostly collected during the COVID-19 Pandemic which made it more difficult to establish regular periods between data collections.

⁴14 is the age at which young people are generally cognitively competent to give informed consent to participate in research (Sanci et al., 2004).

323 Malagasy as it is taught in school. During the questionnaire's administration, adults fluent in the
324 local dialects were present to support participants' understanding, if required.

325
326

3.3.1. *Satisfaction and frustration of the needs of autonomy, competence and relatedness*

327 To assess satisfaction and frustration of the BPN as well as the satisfaction of the need
328 for autonomy, relatedness and competency, we used the *basic psychological needs satisfaction*
329 *and frustration scale (BPNSF)* (Chen et al., 2015b). This scale consists of 24 items, using a five-
330 point Likert-type scale, ranging from "not true at all" to "completely true", where participants
331 rate the accuracy of each statement for themselves. The scale can be divided into various
332 subscales. Among the 24 items, eight of them measure the satisfaction of the need for
333 autonomy (for the present research, $\alpha_1 = 0.25$; $\alpha_2 = 0.28$; $\alpha_3 = 0.34$; $\alpha_4 = 0.55$). Four of the
334 eight items express the satisfaction of the need (e.g., "I feel a sense of choice and freedom in
335 the things I undertake"), and four items (reversed) express the need's frustration (e.g., "Most of
336 the things I do feel like "I have to"). Eight items measure the satisfaction of the need for
337 relatedness (for the present research, $\alpha_1 = 0.32$; $\alpha_2 = 0.43$; $\alpha_3 = 0.40$; $\alpha_4 = 0.49$), with four
338 items expressing the satisfaction of the need and four items (reversed) expressing the need's
339 frustration (e.g., "I feel connected with people who care for me, and for whom I care", "I feel the
340 relationships I have are just superficial"). Eight items measure the satisfaction of the need for
341 competence (for the present research, $\alpha_1 = 0.22$; $\alpha_2 = 0.41$; $\alpha_3 = 0.23$; $\alpha_4 = 0.16$), again,
342 four items express the need's satisfaction and four items (reversed) express the need's
343 frustration (e.g., "I feel confident that I can do things well", "I feel disappointed with many of my
344 performance"). The fit indices for these three factors at T1⁵ are $\chi^2/df=1.98$, $IFI=0.44$, $CFI=0.41$,
345 $TLI=0.34$, $GFI=0.83$, $AGFI=0.80$, $SRMR= 0.09$, $RMSEA= 0.06$. The 24 items can also be grouped in
346 two subscales of 12 items each, measuring separately the needs' satisfaction (for the present
347 research, $\alpha_1 = 0.49$; $\alpha_2 = 0.41$; $\alpha_3 = 0.55$; $\alpha_4 = 0.59$) and frustration (for the present
348 research, $\alpha_1 = 0.62$; $\alpha_2 = 0.72$; $\alpha_3 = 0.69$; $\alpha_4 = 0.66$). The internal consistency of the
349 Malagasy version of the scale is lower than the original tool (Chen et al., 2015b), that was
350 validated with four populations (Belgium, China, Peru, and the United States of America), and
351 ranged from $\alpha=.64$ to $\alpha=.89$ depending on environmental, sociodemographic, and cultural
352 factors. The fit indices for these two factors at T1 are $\chi^2/df=1.78$, $IFI=0.55$, $CFI=0.53$, $TLI=0.48$,
353 $GFI=0.86$, $AGFI=0.83$, $SRMR=0.08$, $RMSEA=0.06$. For each need subscale, items expressing the
354 need's frustration were reversed, then total scores were calculated by adding item scores.
355 Scores could range from 8 to 40. For the satisfaction and frustration subscales, items were not
356 reversed and scores were simply added. Scores ranged from 12 to 60.

3.3.2. *Well-being index*

357
358 To measure youth well-being an index was created based on four scales, assessing
359 three positive psychological constructs, self-esteem, life satisfaction, and vitality, and one
360 negative psychological construct, depression. To create the well-being scores, we transformed
361

⁵ Fit indices have been calculated for each variable of interest at each time of measure and are reported in appendix A.

362 the four variables' scores in z-scores. Depression z-scores were reversed. Then the z-scores of
363 the four variables were averaged to obtain a well-being score.

364 Global self-esteem was measured by the Self-Esteem Scale (Rosenberg, 1965, Chapter
365 2), which measures the extent to which an individual generally considers him/herself to be a
366 person of value, who possesses good qualities, who has a positive attitude toward him/herself,
367 and who does not consider him/herself to be a failure, useless, or good for nothing. This
368 measure is composed of 10 items, rated on a five-point Likert-type scale ranging from "strongly
369 agree" to "strongly disagree". Total scores can range between 10 to 50 and are calculated by
370 adding items' scores. Internal consistency is $\alpha=.90$ for this scale. The internal consistency of the
371 Malagasy version of the scale is $\alpha T1= 0.21$; $\alpha T2= 0.39$; $\alpha T3= 0.26$; $\alpha T4= 0.40$. The fit indices at
372 T1 are $\chi^2/df= 2.05$, $IFI=0.38$, $CFI=0.24$, $TLI=0.02$, $GFI=0.95$, $AGFI=0.92$, $SRMR=0.07$, $RMSEA=0.07$.

373 Satisfaction with life, recognized as a subjective indicator of well-being, was measured
374 by the *Satisfaction with Life Scale* (Diener, 1984). This scale consists of five items that lead the
375 participant to evaluate his or her overall satisfaction with life. For each item, the participant
376 expresses his or her level of agreement with the proposed statement using a seven-point Likert
377 scale. Total scores can range between 7 to 35 and are calculated by adding items' scores. The
378 original tool with a population of students has an internal consistency of $\alpha=.87$. The version of
379 the scale translated in Malagasy has an internal consistency of $\alpha T1 = 0.50$; $\alpha T2 = 0.54$; $\alpha T3 =$
380 0.67 ; $\alpha T4 = 0.67$. The fit indices at T1 are $\chi^2/df=1.59$, $IFI=0.97$, $CFI=0.97$, $TLI=0.95$, $GFI=0.99$,
381 $AGFI=0.96$, $SRMR=0.04$, $RMSEA= 0.05$.

382 Vitality was measured by the *Subjective Vitality Scale* (Ryan & Frederick, 1997). This scale
383 consists of seven items that describe a person's level of energy and vitality. The participant is
384 asked to decide the level of agreement between the items presented and how he or she
385 generally feels using a seven-point Likert-type scale. Total scores can range between 7 to 49
386 and are calculated by adding items' scores. This scale indicates an internal consistency of $\alpha=.80$.
387 The version of the scale translated in Malagasy has an internal consistency of $\alpha T1= 0.31$; $\alpha T2=$
388 0.48 ; $\alpha T3= 0.62$; $\alpha T4= 0.51$. The fit indices at T1 are $\chi^2/df=2.14$, $IFI=0.73$, $CFI=0.70$, $TLI=0.54$,
389 $GFI=0.97$, $AGFI=0.94$, $SRMR= 0.06$, $RMSEA= 0.07$.

390 Depression was measured by the Center for Epidemiologic Studies Depression Scale
391 (CES-D) (Radloff, 1977). This scale consists of 20 items relating to depressed mood. The
392 participant is asked to indicate the frequency of symptoms experienced during the past week
393 on a four-point scale ranging from "very rarely (less than one day)" to "very often (five to seven
394 days)". Total scores can range between 20 to 80 and are calculated by adding items' scores. The
395 lowest score relates to a low depressed mood. The original tool demonstrates an internal
396 consistency of $\alpha=.85$. The version of the scale translated in Malagasy has an internal
397 consistency of $\alpha T1= 0.70$; $\alpha T2= 0.69$; $\alpha T3= 0.72$; $\alpha T4= 0.75$. The fit indices at T1 are $\chi^2/df=1.63$,
398 $IFI=0.77$, $CFI=0.76$, $TLI=0.73$, $GFI=0.89$, $AGFI=0.87$, $SRMR=0.07$, $RMSEA=0.05$.

399 3.3.3. Socio-economic status

400 The socio-economic status was calculated based on several variables. To our
401 knowledge, there is no established official socio-economic status classification for Madagascar.
402 Hence, relying on the expertise of the partner NGO staff, who possess an in-depth
403

404 understanding of the community, we developed a classification for socio-economic status. This
405 classification underwent validation and discussion with these experts. To obtain a measure of
406 the socio-economic status of our participants, we collected data on the neighborhood which
407 the participant reported living in, as well as their parents' and/or guardian's occupation. The
408 term « guardian » refers to a person who is considered by the young person as a parental
409 figure. As it is the case in other African contexts, there are, in fact, individuals in Malagasy
410 families who are referred to as 'parents' without the degree or nature of their relationship with
411 a child being specified. To determine the socio-economical level of each neighborhood, as well
412 as the level of economic contribution of the parent-guardian's occupation to the household, we
413 asked five members of the staff of our local partner NGO to rate each neighborhood and
414 parents-guardian's occupations from 1 to 5, 1 being a poor neighborhood or a low economic
415 contribution to the household. A mean of the answer of the five staff members was calculated
416 to attribute a score to each neighborhood and occupation. Each participant living with either
417 one or two parents and, or, with a guardian, we had to create a score representing the "level of
418 family income". To do so, a mean of the score of all parents and/or guardian occupations was
419 calculated. Then, to obtain a score of socio-economic status, we calculated a mean of the socio-
420 economic level of each neighborhood and the level of family income for each participant. The
421 total score was between 1 and 5, 1 being very low and 5 corresponding to a very high socio-
422 economic status.

423 424 3.3.4. *Data analysis*

425 Before engaging in further analysis, we first examined the link between well-being and
426 the BPN in a Malagasy youth sample, to assess the universality of the BPN as stated in the BPN
427 Theory (Ryan & Deci, 2000) and its applicability in a Malagasy population. The effect size is
428 considered small if the value of r varies around 0.1, medium if it varies around 0.3 and large
429 around 0.5 (Cohen, 1992).

430 Mixed factorial Analyses of Variance (mixed factorial ANOVAs) were conducted to
431 evaluate whether the participation in extracurricular activities, art and sport, had a significant
432 effect over time on well-being and the BPN of autonomy, competency and relatedness.
433 Specifically, this analysis was used to examine the interaction effects of time (four measures
434 over 16 months; within-subjects level) and the practice of an extracurricular activity (art vs sport
435 vs control; between-subjects level) on well-being variables as well as the BPN variables. The
436 analyses take into account the age of the participants, their gender and their socio-economic
437 status as control variables. Post-hoc tests were conducted and a Bonferroni correction was
438 used. The level of statistical significance was set at $p < .05$. The strength of effect sizes was
439 evaluated through partial eta squared (η_p^2) with .01 indicating a small, .06 a moderate,
440 and .14 a large effect (Cohen, 1992). Mixed factorial ANOVAs were performed on 96
441 participants, out of 262, that were present at the four measurements time. Exploratory
442 analyses showed that there were no significant differences between the 96 participants that

443 were included in the analysis and the 166 that were excluded, regarding age, gender, socio-
444 economic status and variables of interest. Post-hoc power analysis, calculated with GPower 3.1,
445 showed that a sample of 96 participants is sufficient to detect moderate effect sizes with
446 adequate power (83%) in the factorial mixed ANOVAs.

447 For all the variables of interest, ANOVAs have been performed preliminary to confirm
448 that there were no existing significant differences between the three groups at T1.

449 The normality assumption was checked for each variable through a visual inspection of
450 the distribution, and the verification of skewness and kurtosis values comprised between -1 et
451 +1. Scores are considered extreme if they are more than 3 standard deviations from the mean.
452 If outliers were present, the variable was winsorized. Thus, the extreme score was replaced
453 with a score three standard deviations from the mean. After winsorizing, the normality
454 assumption was respected for all variables and there were no more outliers. Hence, the validity
455 of the results of the statistical tests was ensured. The principal analyses were conducted using
456 SPSS 28, while fit indices were reported using R (2022), precisely the "lavaan" package (Rosseel,
457 2012).

458 459 3.3.5. Ethics

460 At T1, a consent form, written in Malagasy, was read and explained to small groups of
461 youth who wish to engage in the research by researchers. Its understanding was validated with
462 the young people throughout the reading. Consent was reiterated verbally at each following
463 step of data collection.

464

465 4. RESULTS

466 4.1. Applicability of the BPN mini-theory in a Malagasy population

467 To examine the relationship between well-being and the BPN of autonomy, relatedness
468 and competence, as well as the relationship between well-being and overall BPN' satisfaction
469 and frustration Pearson correlations were applied to the 262 participants recruited at T1 (Table
470 1). Participants were 108 females and 154 males, with a mean age of 15.14 (1.41). From the
471 descriptive analysis, it was found that the participants presented similar values in the
472 satisfaction of the three BPN.

473

474 Insert Table 1 here

475

476 In a sample of Malagasy teenagers, the results show that well-being is significantly and
477 positively associated with the need for autonomy, relatedness and competence, with an effect
478 size between small and medium. Well-being is also significantly, positively and moderately
479 associated with overall satisfaction of BPN. Well-being is significantly and negatively associated
480 with overall needs' frustration, with a rather small effect size. We observe that, in our sample,

481 the variables forming the well-being index are individually associated with the satisfaction
482 and/or frustration of BPN (see table 1).

483

484 **4.2. Effect of participation over time**

485 From the 262 participants recruited in T1, a general attrition was observed with 158
486 participants at T2 and 115 participants remaining at T3. Only 96 participants were present at
487 the four measurements time, and constitute our final sample. Table 2 shows the distribution by
488 group of our sample regarding age (T1), gender, and socio-economic status. All groups are not
489 significantly different in age, gender representativity and socio-economic status. Nevertheless,
490 the percentage of male is more important in the art group than in the two other groups. Also,
491 participants in the sport group are slightly younger than in the two other groups, and
492 participants in the art group are a bit older than in the two groups of comparison.

493 Furthermore, in terms of socioeconomic status (SES), the percentage of youth from the
494 control group with a low SES is slightly higher compared to the youth in the experimental
495 groups. In addition, two participants in the control group have a relatively high SES, whereas
496 none of the youth in the experimental groups fall into this category. These points reinforce our
497 reasoning to consider age, gender and SES variables as control variables in our main analysis.

498 Insert Table 2 here

499

500 Insert Plot 1 here

501

502 Regarding the need for autonomy, there is a significant time by group quadratic
503 interaction effect, $F(2,87) = 3.25, p = .043, \eta_p^2 = .07$, which is a medium effect size. In the art
504 group, there is a significant simple quadratic effect of time, $F(1,24) = 8.65, p = .007, \eta_p^2 = .27$,
505 which can be interpreted as a rather large effect size. More specifically, the satisfaction of the
506 need for autonomy significantly increases between the first ($M=26, SD=5.17$) and the second
507 measurement ($M=28.96; SD=2.96$), $p = .037$, then remains rather stable. The participants
508 involved in sport activities and those not participating in any activities show no significant
509 change over time.

510 The evolution over time did not differ significantly in the three groups regarding the
511 needs of competence, $F(6,261) = 0.39, p = .888, \eta_p^2 = .01$ (small effect size), and relatedness, F
512 ($6,261$) = 1.47, $p = .189, \eta_p^2 = .03$ (between small and medium effect size).

513

514 Insert Plot 2 here

515

516 Regarding the frustration of the BPN, there is a significant time by group quadratic
517 interaction effect, $F(2,87) = 3.54, p = .033, \eta_p^2 = .08$ (medium effect size). In the art group, there
518 is a significant simple quadratic effect of time, $F(1,24) = 10.22, p = .004, \eta_p^2 = .30$. The effect
519 size is rather large. More specifically, the frustration of the needs significantly diminishes
520 between the first ($M=35.89, SD=7.65$) and the second measurement ($M=31.83, SD=5.59$),
521 $p = .019$, then remains rather stable. The participants involved in sport activities and those not
522 participating in any activities show no significant change over time.

523
524 Insert Plot 3 here
525

526 Given that the evolution over time of the Arts and Sports groups is similar for the
527 satisfaction of BPN, $F(3,126) = 0.61$, $p = .608$, $\eta^2_P = .01$, the two groups are combined to form
528 an experimental group, which is, then, compared to the control group. There is a significant
529 time by group (experimental vs control) linear interaction effect, $F(1,88) = 4.31$, $p = .041$,
530 $\eta^2_P = .05$, which comes close to a medium effect size. For the control group, there is a
531 significant simple linear effect of time, $F(1,45) = 4.59$, $p = .038$, $\eta^2_P = .09$, (medium to large
532 effect size) manifesting as a decrease of the needs' satisfaction over time. This linear effect is
533 not appearing for the experimental group, $F(1,49) = 1.38$, $p = .245$, $\eta^2_P = .03$. The effect size is
534 quite small, which indicates that the rather small sample size ($N_{exp} = 50$, $N_{ctrl} = 46$) does not
535 seem to influence the significance of our results. The satisfaction of the needs of the
536 participants involved in the two extracurricular activities seem to remain stable over time, whilst
537 decreasing for the participants not involved in any extracurricular activities.

538 The evolution over time of the youth well-being did not differ significantly in the three
539 groups, $F(6,261) = 0.89$, $p = .500$, $\eta^2_P = .02$. Looking at each of the variables composing the
540 well-being index, the evolution over time did not differ significantly in the three groups for
541 neither satisfaction with life, $F(6,261) = 1.22$, $p = .298$, $\eta^2_P = .03$; depression, $F(6,261) = 0.83$,
542 $p = .546$, $\eta^2_P = .02$; vitality, $F(6,261) = 0.68$, $p = .669$, $\eta^2_P = .02$; or self-esteem, $F(6,261) = 1.10$,
543 $p = .365$, $\eta^2_P = .02$.
544

545 **5. DISCUSSION**

546 **5.1. BPN and well-being association**

547 The relationship between the satisfaction and the frustration of BPN and psychological
548 well-being is supported by many studies, in various contexts (Chen et al., 2015b). Our research
549 findings support the general proposition of Self-determination mini-theory on BPN (Ryan &
550 Deci, 2017). This theory postulates that the satisfaction of the three BPN is associated with well-
551 being, whilst need's frustration is associated with greater ill-being. In our sample of vulnerable
552 youth from the south of Madagascar, we observe a positive association between well-being and
553 the need for autonomy, relatedness and competence, as well as overall satisfaction of BPN,
554 which is similar to what has been found in various other socio-cultural contexts (Chen et al.,
555 2015b), including South-Africa. Similarly to this research, we observe a negative relationship be-
556 tween well-being and the overall needs' frustration as well as individual association between
557 the satisfaction and/or frustration of BPN and the variables forming the well-being index,
558 namely satisfaction with life (Leversen et al., 2012), vitality (Ryan et al., 2010), self-esteem (Moller
559 et al., 2006) and depression (Cordeiro et al., 2016). Our findings allow us to support the use of
560 the BPN' concept in our research context, and to explore the evolution of the satisfaction and
561 frustration of those needs, as well as the well-being of youth involved in extracurricular activi-
562 ties. While our findings align with the BPN theory, we recommend to the research community

563 to investigate these connections in diverse Global South contexts. Other studies have high-
564 lighted the scarcity of valid psychometric measures for these concepts in the international de-
565 velopment field. (Sayanagi & van Egmond, 2023). Exploring qualitative research methods may
566 also offer a promising avenue for refining the model in such contexts (Lynch et al., 2020).

567
568 **5.2. Evolution of the satisfaction and frustration of BPN**

569 This longitudinal study tried to measure the evolution of well-being, satisfaction and
570 frustration of BPN of youth developing in an extreme context of development who participated
571 in extracurricular activities. Our results suggest that the satisfaction of the need for autonomy
572 for participants involved in art activities seems to evolve positively during the first nine months
573 of their involvement, then stays rather stable for, at least, the next seven months. The satisfac-
574 tion of the need for autonomy also seems to evolve positively for the participants involved in
575 sport activities, but not in a statistically significant way. Those two groups have been compared
576 to a similar group of young people not involved in extracurricular activities (control group), for
577 whom the satisfaction of the need for autonomy tends to diminish over time, but not in a statis-
578 tically significant way. Similarly, the frustration of the need for autonomy, competence and re-
579 latedness, considered all together, for participants involved in art activities, seems to diminish
580 during the first nine months of their involvement, then stays rather stable for, at least, the next
581 seven months. The needs' frustration stays rather stable for the participants involved in sport
582 activities and for those not involved in any extracurricular activities.

583 This lack of significant effect, in the sport group, for the satisfaction of the need for au-
584 tonomy and the needs' frustration can be related to various factors. From our observation on
585 the field and attempt to deeper understand how the activities are organised (Author 6 et al.,
586 2021), we found that the organ of the NGO that offers art activities (MUSIC CENTRE - Socio-Edu-
587 cational and Musical Centre) has more material, further trained workers, financial support and
588 experience running their activities (2008 versus 2014), than the organ that offers sport activities
589 (SSS - Socio-sport school). Therefore, it is possible that by offering equal opportunities to sup-
590 port the SSS financially, logistically, in terms of staff training and numbers, results observed in
591 the art group could be observed in the sport group. Obviously, the NGO, with its current re-
592 sources, will need external support from funders to achieve these goals.

593 Also, the context in which the data have been collected may have affected our results
594 more generally. It is important to note that data collection for this research started in February
595 2020, just before the COVID-19 pandemic hit the world, without sparing Madagascar. Between
596 March and October 2020, extracurricular activities have been largely impacted and put on hold.
597 Whilst sport activities were completely stopped and started to resume in October 2020, some
598 art activities, like the marching band and the circus were able to maintain some level of activity
599 during the pandemic as sessions were held outdoors and social distancing was possible.

600 Contrary to other research which found interesting results regarding the need for com-
601 petence and relatedness (Leversen et al., 2012), there was no statistically significant evolution
602 of the satisfaction of these needs over time. Nevertheless, the evolution of the satisfaction of
603 the need for relatedness over time between the three groups had an effect size between small
604 and medium and a p value close to 0.1. When interpreting a non-significant result, while the

605 statistical power of a test is limited by a small sample size, it is important to consider the effect
606 size found in addition to the p value (Kline, 2004). According to Stevens (2012), 0.1 can be an
607 adjusted significance level from the common 0.05 p value, when the sample size per group is
608 small ($n \sim 20$). Therefore, it is possible that a larger sample size could have influenced our re-
609 sults for the need of relatedness. Despite the small sample size in this study ($n = 25$ for the art
610 and sport groups) and the higher probability of making a type 2 error, the authors of the pre-
611 sent study decided to retain the statistical significance level of 0.05. We still think it is worth
612 mentioning results when the effect size is interesting, and level of significance is close to 0.1.

613 Even more in the case of the need for relatedness, as some preliminary results from a
614 qualitative study with fourteen young people from the present experimental group (Author1 et
615 al., 2022), suggest the importance of the relationship developed with peers for youth involved
616 in extracurricular activities. Indeed, in the interviews, youth mention that the activities enabled
617 them to make new and close friends, who could be supportive and look after each other. For
618 instance, they refer to their peers in the activities as being like brothers and sisters.

619 For the overall satisfaction of the BPN, the experimental group was considered as a
620 whole as the evolution over time of the Arts and Sports groups was similar. That experimental
621 group was compared with the control group in order to verify if the satisfaction of the needs
622 would evolve over time for both groups. Results show that it stayed rather stable over time for
623 the experimental group, but decreased quite continuously for the control group along the 16
624 months of this research. Therefore, it seems that extracurricular activities, either sport or art,
625 have a protective effect on the satisfaction of BPN of our participants. As discussed, these re-
626 sults might have been influenced by the COVID-19 situation during which these data were col-
627 lected, where most extracurricular activities were put on hold for a few months and youth were
628 not attending school either, as they were closed. Contrary to many global North Countries,
629 most Malagasy schools and their students at home do not have the infrastructure to pursue
630 education online. The closure of schools and extracurricular activities might have had conse-
631 quences on the satisfaction of BPN (Calvo et al., 2020) for the youth of Toliara. Indeed, youth
632 were restricted from moving freely and going about their usual activities (autonomy), meeting
633 their friends (relatedness) and working on their education (competence). From data collected
634 through open ended questions on the consequences of COVID-19 asked to our sample groups
635 during the two last data collections, in March and June 2021, we have results that support this
636 hypothesis. It seems that social isolation measures had a clear impact on our sample and have
637 caused a certain level of distress and anxiety for the youth. The participants complained that
638 they could not go to school for such an extended period of time and be free to move (auton-
639 omy). They were worried about their education and feared to lose their knowledge and capaci-
640 ties (competence). The participants also mentioned that they found it hard to not be able to
641 keep in touch with their friends and members of the extended families (relatedness). However,
642 our results suggest that the extracurricular activities might have mitigated the consequences of
643 the measures taken to contain COVID-19 on the satisfaction of BPN for the participants of the
644 experimental group. Moreover, the frustration of the BPN was not negatively affected for either
645 group, and even diminished in the art group. This point is quite important, as research in SDT
646 has shown that a low satisfaction of BPN would fail to foster individuals' well-being, and needs'

647 frustration would lead to maladjustment, defensiveness, ill-being, or even psychopathology
648 (Vansteenkiste & Ryan, 2013). It would be interesting to further explore the reasons behind this
649 possible effect of extracurricular activities, so that in possible future pandemic crises, govern-
650 ments can adapt their measures to attenuate negative consequences on youth.

651

652 **5.3. Well-being stagnation**

653 Contrary to other studies (Boelens et al., 2022; Farb & Matjasko, 2012), the present
654 study was not able to capture any effect over time of extracurricular activities on the well-being
655 or any of the composing variables of the index- satisfaction with life, vitality, self-esteem and de-
656 pression. Once again, the COVID-19 pandemic might have influenced our results and cancelled
657 the potential effect of extracurricular activities on the youth's well-being. The lack of results,
658 might also be linked to the tools used for data collection, that were not able to capture the
659 changes.

660

661 **5.4. Practical implications and future perspectives**

662 The results of this research seem to indicate that extracurricular programs have the po-
663 tential to support youth optimal development in extreme contexts. Increasing the awareness of
664 youth workers in challenging environments about the positive impact of extracurricular pro-
665 grams on fulfilling basic psychological needs, and empowering them to incorporate these in-
666 sights into their daily interventions, could help advance the NGO's mission to enhance youth
667 development and well-being. In accordance with Leversen and colleagues (2012), more re-
668 search is needed on the development of knowledge to explain the operating mechanisms be-
669 hind the positive effects of the participation in extracurricular activities. Indeed, a deeper un-
670 derstanding of the mechanism would benefit the development of programs to enhance the
671 components of the activity that really supports youth optimal development. Regarding cultural
672 and language issues that may exist, even within a country, mixed method research could be an
673 interesting avenue to achieve this goal. This methodology could ensure that research better
674 contributes to inform program development, decisions and policies of international institutions,
675 local organizations, those that fund organizations, as well as the practitioners who work day to
676 day to improve youth development. Further research would be interesting to verify that satis-
677 faction and frustration of the basic psychological needs actually predict well-being in a Mala-
678 gasy population, as it has been found in other populations (Ryan & Deci, 2017).

679

680

681 **6. LIMITATIONS**

682 Beyond the limitation already mentioned in the discussion section of this article, a few
683 important points have to be mentioned. Most of our data were collected during the COVID-19
684 pandemic, therefore and as already mentioned there is a need for cautious interpretation of
685 the present findings in the context of the pandemic.

686 The original sample of 262 participants was reduced by nearly 65 % due to both attri-
687 tion and our decision to only consider complete cases. Over the course of the project, partici-
688 pants quit the study for multiple reasons, one of the main being the COVID-19 pandemic. In-
689 deed, like in many places in the world, extracurricular activities and school were stopped for an
690 indefinite period of time. Many children that got enrolled in the activity in February 2020 did
691 not come back when the activity resumed. Based on the NGO's experience, there is always an
692 important attrition in the number of youth who actually stay involved all year long in the activity.
693 We were prepared for at least a drop of 50 % in our sample, but the pandemic pushed this
694 number even further. An option to circumvent this event would have been to recruit new par-
695 ticipants during the new registration period, in January 2021. Unfortunately, regarding the un-
696 certainty of the pandemic at that time, the travel restrictions within Madagascar, limitations in
697 budget, human resources and time constraints, it was not possible for our team to retain this
698 avenue. This rather large attrition resulted in a small number of participants, particularly, in the
699 experimental sub-groups, with 25 participants in both the sport and art group, which induced a
700 diminution of the statistical power of the analyses that were performed. This attrition pre-
701 vented us from looking at our data through gender and socio-economic status, as some re-
702 search found interesting results regarding both of these variables (Heath et al., 2018). Never-
703 theless, in our analyses, we did control for gender and SES.

704 Also, despite many efforts of the NGO's workers to keep track of the attendance in their
705 extracurricular activities, we were not able to have a full picture of how frequently youth have
706 participated in the activity. However, we could assume that the youth who kept replying to the
707 questionnaires were those who were frequently participating in the activities. Indeed, during
708 the activity session just prior to the data collection, participants were informed of its upcoming.
709 Therefore, people not frequently attending the activities would most likely not have been aware
710 of the data collection periods.

711 To our knowledge, the present research is the first quantitative study to examine the
712 well-being in a Malagasy population. Therefore, no instruments measuring well-being, or re-
713 lated concepts, were available and validated in a Malagasy population. We could have used a
714 French validated version of the tools, as French is one of the official languages of Madagascar.
715 Nevertheless, it is fluently spoken mainly by people who have reached a rather high level of ed-
716 ucation. By choosing scales in French, we would not have been able to reach out to vulnerable
717 youth in the south of the country who hardly have access to education. Therefore, we focused
718 on finding tools that are sensitive to culture, that were tested in similar socio-cultural contexts,
719 and to translate them in a culturally sensitive way, in official Malagasy. Even that decision was
720 not ideal, as Madagascar has at least twelve different dialects. Even though the different lan-
721 guages are relatively close, the official Malagasy, taught at school, is the Malagasy spoken by the
722 Merna ethnic group, more dominant in the highlands region. It carries a history of struggles
723 and power dynamics between the Merna ethnic groups and other ethnic groups in Madagas-
724 car. Also, it is possible that some concepts chosen to measure well-being in our research are
725 understood differently in the Malagasy culture. The rather low internal consistency indices
726 (Cronbach's alphas) and suboptimal fit indices observed in the confirmatory factor analyses

727 (CFAs) across our various scales might be reflecting this issue and affect the reliability of the re-
728 sults obtained. To advance research on well-being within the Malagasy context, we align with
729 the perspective of fellow researchers (Sayanagi & van Egmond, 2023) in emphasizing the im-
730 portance to either develop scales or validate existing ones. This is crucial in ensuring that any
731 absence of results is genuinely attributed to the variables under consideration, rather than any
732 limitations in the measurement tools employed. We encourage researchers to develop scales
733 that are culturally sensitive and that considers cultural issues within the country itself, to further
734 the quality of research in Madagascar.

735 On a more correlational stand, further research is needed to determine if the associa-
736 tion we found between the variables of interest can be replicated over a more diverse sample
737 in Madagascar. Further analysis could be performed in order to take into account the associa-
738 tion between the variables of interest at all measurement times.

739

740 **7. CONCLUSION**

741 Participation in extracurricular activities seems to have some positive outcomes for
742 youth living in an extreme context of development. Even though we could not grasp the effect
743 of extracurricular activities on psychological well-being in our sample, we see that related varia-
744 bles such as the need for autonomy and the frustration of the BPN evolve in a positive direc-
745 tion over time for the youth developing in extreme contexts and involved in extracurricular pro-
746 grams. These activities seem also to have a protective effect over the diminution of the satisfac-
747 tion of the BPN. Therefore, with the right amount of support and funds, local NGOs, community
748 centers and other youth programs organizing extracurricular activities could further their work
749 of promoting optimal development of youth living in extreme contexts.

750

751

752 **Declaration of interest statement**

753 The authors have no relevant financial or non-financial interests to disclose.

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756

757 **Compliance with Ethical Standards**

758 This research project was reviewed and approved by the Research Ethics Committee for
759 student projects involving human beings of the Faculty of Human Sciences of the *Université du*
760 *Québec à Montréal* (Ethics approval number: 2020-3016). Informed consent was obtained from
761 all individual participants included in the study.

762

763 **Data availability**

764 The datasets generated during and/or analysed during the current study are available from the

765 corresponding author on reasonable request.

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776 **AUTHORS CONTRIBUTION**

777 All authors contributed to the study conception and design. Material preparation, data
778 collection and analysis were performed by LD, CB, HL, OR and TG. The first draft of the
779 manuscript was written by LD and all authors commented on previous versions of the
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Table 1. Pearson correlation coefficients, means (M) and standard deviations (SD)

	M	SD	1	2	3	4	5	6	7	8	9
1. Well-being	.00	.63	-								
2. Satisfaction with life	23.63	5.26	.62***	-							
3. Vitality	34.97	6.16	.67***	.30***	-						
4. Self-esteem	26.97	3.37	.64***	.15*	.23***	-					
5. Depression	42.68	8.52	-.59***	-.12	-.14*	-.21***	-				
6. Autonomy	27.43	4.19	.19**	.10	.08	.12*	-.17**	-			
7. Relatedness	27.43	4.51	.21***	.14*	.08	.13*	-.20***	.24***	-		
8. Competence	27.42	3.79	.23***	.03	.11	.26***	-.18**	.30***	.23***	-	
9. Needs' satisfaction	45.96	5.51	.29***	.25***	.28***	.11	-.07	.39***	.46***	.37***	-
10. Needs' frustration	35.69	7.27	-.14*	.04	.07	-.20**	.26***	-.58***	-.53***	-.56***	.06

***. Correlation is significant at the 0.001 level (2-tailed) **. Correlation is significant at the 0.01 level (2-tailed) *. Correlation is significant at the 0.05 level (2-tailed).

837 Table 2. *Descriptive statistics*

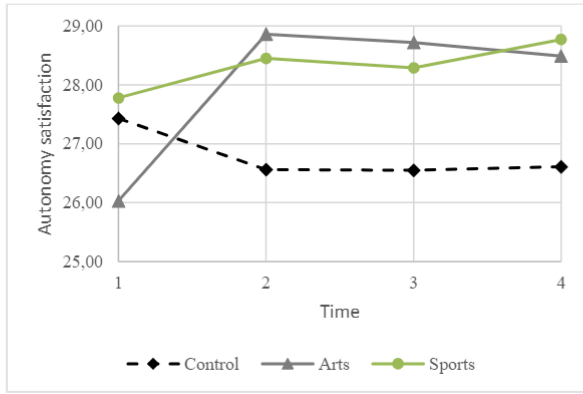
	Experimental group		Control group	TOTAL
	Art	Sport		
Gender				
F	7 (28%)	12 (48%)	21(45.7%)	40 (41.7%)
M	18 (72%)	13 (52%)	29 (54.3%)	56 (58.3%)
Age Mean (SD)				
	15.40 (1.68)	14.79 (1.46)	15.03 (1.11)	15.07 (1.37)
Socioeconomic status				
Very low	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Low	13 (56.5%)	13 (54.2%)	32 (69.6%)	58 (62.4%)
Medium	10 (43.5%)	11 (45.8%)	12 (26.1%)	33 (35.5%)
High	0 (0%)	0 (0%)	2 (4.3%)	2 (2.2%)
Very high	0 (0%)	0 (0%)	0 (0%)	0 (0%)

838 *Missing data for SES: two in the art group, one in the sport group

839

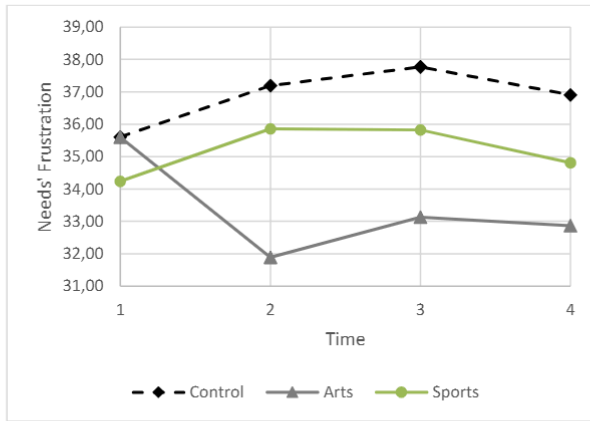
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841 Plot 1 Autonomy satisfaction through time
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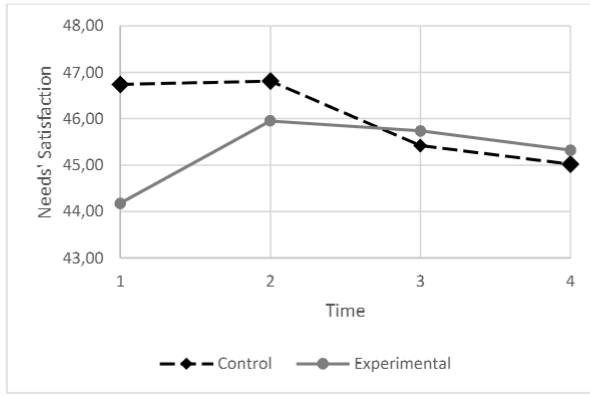
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847 Plot 2 Needs' frustration through time
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852 Plot 3 Needs' satisfaction through time
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Supplementary material

Appendix A: Fit indices for each variable of interest at each time of measurement

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Basic psychological needs Autonomy Competence Relatedness	χ^2/df	IFI	CFI	TLI	GFI	AGFI	SRMR	RMSEA
T1	1.98	0.44	0.41	0.34	0.83	0.80	0.09	0.06
T2*	NA	NA	NA	NA	NA	NA	NA	NA
T3*	NA	NA	NA	NA	NA	NA	NA	NA
T4	1.60	0.48	0.43	0.36	0.77	0.72	0.11	0.07

861 * For these CFAs, the model did not converge, possibly due to a sample size too small to estimate a three factors model.

862

Basic psychological needs Satisfaction- Frustration	χ^2/df	IFI	CFI	TLI	GFI	AGFI	SRMR	RMSEA
T1	1.78	0.56	0.53	0.48	0.86	0.83	0.08	0.06
T2	1.35	0.72	0.69	0.66	0.84	0.81	0.08	0.05
T3	1.44	0.63	0.59	0.55	0.81	0.78	0.09	0.06
T4	1.42	0.63	0.60	0.56	0.79	0.75	0.10	0.06

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Self-esteem	χ^2/df	IFI	CFI	TLI	GFI	AGFI	SRMR	RMSEA
T1	2.05	0.37	0.24	0.02	0.95	0.92	0.07	0.07
T2	2.10	0.41	0.31	0.11	0.92	0.87	0.09	0.08
T3	2.33	0.12	0	-0.39	0.91	0.86	0.09	0.10
T4	3.70	-0.31	0	-0.96	0.89	0.82	0.10	0.15

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Satisfaction with life	χ^2/df	IFI	CFI	TLI	GFI	AGFI	SRMR	RMSEA
------------------------	-------------	-----	-----	-----	-----	------	------	-------

T1	1.59	0.98	0.97	0.95	0.99	0.96	0.04	0.05
T2	3.37	0.83	0.82	0.64	0.96	0.87	0.07	0.12
T3	2.33	0.93	0.92	0.85	0.97	0.90	0.06	0.10
T4	1.76	0.96	0.95	0.90	0.97	0.91	0.04	0.08

865

Vitality	χ^2/df	IFI	CFI	TLI	GFI	AGFI	SRMR	RMSEA
T1	2.14	0.73	0.69	0.54	0.97	0.94	0.06	0.08
T2	3.19	0.44	0.36	0.04	0.94	0.88	0.08	0.18
T3	1.85	0.87	0.86	0.78	0.93	0.86	0.08	0.08
T4	1.85	0.84	0.83	0.74	0.95	0.90	0.07	0.09

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Depres- sion	χ^2/df	IFI	CFI	TLI	GFI	AGFI	SRMR	RMSEA
T1	1.63	0.77	0.76	0.73	0.89	0.87	0.07	0.05
T2	1.30	0.80	0.78	0.76	0.88	0.85	0.07	0.04
T3	1.54	0.69	0.67	0.63	0.82	0.78	0.09	0.07
T4	1.57	0.70	0.67	0.64	0.81	0.77	0.09	0.07

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Appendix B: Extra references

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