

1 **The South African 24-hour movement guidelines for birth to five**  
2 **years: an integration of physical activity, sitting behaviour, screen**  
3 **time and sleep**

4  
5 **Running title: SA 24-hour movement guidelines for birth to five years**

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47 **Key words** (3-5): physical activity, sedentary behaviour, sleep, early childhood, movement

48

## 49 **Abstract**

### 50 **Background:**

51 In December 2018, the South African (SA) 24-hour movement guidelines for birth to five  
52 years were released. This paper describes the process used to develop these guidelines.

53

### 54 **Methods:**

55 The Grading of Recommendations Assessment, Development and Evaluation (GRADE)-  
56 ADOLOPMENT approach was followed, with some pragmatic adaptations, using the Australian  
57 guidelines for the early years as a starting point. A consensus panel, including stakeholders  
58 in early childhood development and academics, was formed to assist with the development  
59 process.

60

### 61 **Results:**

62 At a face-to-face meeting of the panel, global and local literature were considered.  
63 Following this meeting, a first draft of the guidelines (including a preamble) was formulated.  
64 Further reviews of these drafts by the panel were done via email, and a working draft was  
65 sent out for stakeholder consultation. The guidelines and preamble were amended based  
66 on stakeholder input, and an infographic was designed. Practical 'tips' documents were also  
67 developed for caregivers of birth to 5-year-olds, and early childhood development  
68 practitioners. The guidelines (and accompanying documents) were released at a launch  
69 event and disseminated through various media channels.

70

### 71 **Conclusions:**

72 These are the first movement guidelines for SA, and the first such guidelines for this age  
73 group from a low- and middle-income country.

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## 93 **Background**

94 In recent years, there has been a shift towards integrated guidelines for children’s physical  
 95 activity, sedentary behaviour and sleep. This considers the natural integration of these  
 96 behaviours – referred to as ‘movement behaviours’ – across a 24-hour period, and provides  
 97 a more cohesive message for parents, caregivers, teachers and practitioners. Canada was  
 98 the first country to take this integrated approach, and in 2016 released 24-hour movement  
 99 guidelines for children and adolescents between 5 and 17 years of age.<sup>1</sup> In November 2017,  
 100 Canada co-released 24-hour movement guidelines for children (0-4 years of age),<sup>2</sup> in  
 101 conjunction with Australia (0-5 years of age).<sup>3</sup> Earlier in 2017, the World Health Organization  
 102 (WHO) initiated a process to develop the first global guidelines for physical activity,  
 103 sedentary and sleep behaviour for the early years. These guidelines are responsive to the  
 104 WHO Ending Childhood Obesity (ECHO) Reports,<sup>4,5</sup> which highlighted the need to address  
 105 24-hour movement behaviours in early childhood for the prevention and management of  
 106 obesity and non-communicable diseases (NCDs). Furthermore, these guidelines address the  
 107 importance of these movement behaviours for other developmental outcomes that are  
 108 important in early childhood, such as cognitive development and psychosocial health.<sup>2,3</sup>

109

110 These developmental outcomes are important in South Africa (SA), which is a country with a  
 111 high burden of NCDs, and the highest obesity prevalence in Africa,<sup>6</sup> with 68% of women (15  
 112 years and older) being overweight or obese.<sup>7</sup> In SA, there is a need for obesity prevention in  
 113 early childhood.<sup>8</sup> In 2013, 23% of 2-5-year-old children were reported to be  
 114 overweight/obese,<sup>9</sup> and research from a low-income urban SA setting has shown that  
 115 obesity in the preschool years is highly predictive of obesity in adolescence.<sup>10</sup> Despite these  
 116 concerning statistics, there have been no guidelines developed for any of the 24-hour  
 117 movement behaviours for any age group in South Africa, including the early years.  
 118 Considering the ECHO Reports’ emphasis on early prevention of obesity, 24-hour movement  
 119 guidelines for 0-5-year-old children could be considered a logical starting point, particularly  
 120 in light of the progress made in countries such as Canada and Australia on 24-hour  
 121 movement guidelines for the early years.

122

123 The aim of this paper was to describe the process of developing the SA 24-hour movement  
 124 guidelines for birth to five years. This process happened concurrently with the development  
 125 of global guidelines for physical activity, sedentary and sleep behaviours in the early years  
 126 by the WHO.<sup>11</sup>

127

## 128 **Methods**

### 129 **GRADE-ADOLPMENT process**

130 For the SA guidelines, the Grading of Recommendations Assessment, Development and  
 131 Evaluation (GRADE)-ADOLPMENT approach<sup>12</sup> was followed, which is the approach used by  
 132 the Australian early years guideline development group to adapt the Canadian early years  
 133 guidelines.<sup>3</sup> This approach refers to the process of adopting, adapting, or *de novo*  
 134 developing guidelines, and allows guideline groups to capitalise on previous work when  
 135 developing or updating guidelines. This adaptive approach was deemed appropriate for SA,  
 136 given that there may be contextual differences between SA (a middle-income country with  
 137 extreme inequality and widespread poverty), and Canada and Australia (both high-income  
 138 countries). Furthermore, the GRADE-ADOLPMENT approach encourages the involvement

139 of a range of stakeholders in the development process (in the consensus panel and  
 140 consultation process). Considering the novelty of these (or any) movement behaviour  
 141 guidelines for SA, it was believed that the involvement of multiple stakeholders would  
 142 encourage stakeholder buy-in and ownership of the SA guidelines, without the need to  
 143 duplicate work already completed by highly competent research groups (for the Canadian  
 144 and Australian guidelines) or to ‘reinvent the wheel’. In light of the somewhat limited  
 145 resources available for the development of these SA guidelines, this was arguably the most  
 146 inclusive, pragmatic and cost-effective approach.

147

148 A timeline and summary of the GRADE-ADOLOPMENT steps that were followed are  
 149 provided in Figure 1. Some additional steps were included in the process, following the  
 150 example of the Australian guideline development group.<sup>3</sup> Steps 1-7 are described (for the SA  
 151 guidelines) in this section as ‘Methods’. The results of Step 7, and the remaining steps are  
 152 described (for the SA guidelines) in the ‘Results’ section.

153

154 [Insert Figure 1 here]

155

### 156 **1. Establish leadership group**

157 Funding for the guideline development process was confirmed in November 2017, and the  
 158 Leadership Group was established shortly after this. The leadership group comprised  
 159 academic researchers with expertise in movement behaviours in children (CED, SAT, APr,  
 160 DER), including the leader of the Australian early years guideline development group (ADO),  
 161 who was the international advisor for the SA guidelines. Other members of the leadership  
 162 group included a representative from the funding body (CM), and a media and marketing  
 163 specialist (TL). The leadership group was chaired by CED.

164

### 165 **2. Form consensus panel**

166 Stakeholders in the field of early childhood development (ECD) in SA, as well as knowledge  
 167 users (including health practitioners) were identified through the networks of the leadership  
 168 group. Representatives of the National Departments of Social Development, Health and  
 169 Basic Education (who are responsible for various aspects of the care of 0-5-year-old children  
 170 in SA) were invited to be members of the consensus panel (only one individual accepted the  
 171 invitation, MLS). These ECD stakeholders and government representatives were seen as a  
 172 vital part of the process, and would be able to provide insight into the acceptability and  
 173 feasibility of disseminating these guidelines, given that movement behaviours are not  
 174 currently a priority issue in early childhood in SA.

175

176 Other academic researchers with expertise in movement behaviours in the early years or  
 177 with expertise in early childhood development were identified from the Scientific Advisory  
 178 Group of the Healthy Active Kids South Africa Report Card<sup>13</sup> and invited to be part of the  
 179 consensus panel. All those invited were given an outline of the guideline development  
 180 process and informed of the consensus panel meeting that was to take place in April 2018.  
 181 The leader of the expert working group for the development of 24-hour movement  
 182 behaviour recommendations for the Under 5s in the United Kingdom (JJR) was invited to be  
 183 an international observer for the SA guideline group. The details of the consensus panel are  
 184 provided in Supplementary Table 1.

185

186 **3. Identify credible existing guidelines, and define criteria for selection of guidelines**

187 As part of this step, the Australian guidelines were identified as the most recently developed  
188 credible guidelines on movement behaviours for the early years. These guidelines met the  
189 following criteria for selection of guidelines:

- 190 • Published in the last 5 years;
- 191 • Addressed clear research questions, contained all Population, Intervention / Exposure,  
192 Comparator, Outcomes (PICO) elements;
- 193 • Followed GRADE or GRADE-ADOLOPMENT process;
- 194 • Allowed for updating (access to full systematic reviews), and provided full access to  
195 search strategy;
- 196 • Existing and accessible GRADE tables and summaries of findings; and

197

198 **GRADE-ADOLOPMENT steps not included**

199 Following the advice of the Australian early years guideline development group, the  
200 following GRADE-ADOLOPMENT steps were not included, as they were deemed to be less  
201 relevant for these types of guidelines:

202 Step 4: Evaluate and complete GRADE Evidence-to-Decision frameworks for each  
203 recommendation; and

204 Step 5: Determine availability, completeness and currency of information about Evidence-  
205 to-Decision criteria.

206

207 **6. Determine appropriateness of PICOs**

208 The PICOs used to guide the update of the systematic reviews for the WHO guidelines were  
209 sent to the consensus panel prior to the consensus panel meeting in order to obtain  
210 feedback on the appropriateness of these PICOs for the SA guidelines. These PICOs were  
211 agreed upon by the SA consensus panel and are provided in Supplementary Table 2.

212

213 **7. Updating of systematic reviews**

214 The development of the SA guidelines took place in parallel with the WHO guideline  
215 development process. Three of the authors (CED, JJR and ADO) were part of the Guideline  
216 Development Group for the WHO guidelines, and the SA consensus panel (along with the UK  
217 expert working group, led by JJR) was given access to these updated systematic reviews to  
218 use for the SA guidelines.

219

220 While the updated systematic reviews provided the evidence base for the  
221 recommendations to be included in the SA guidelines, it was considered important to  
222 review SA literature that could provide insight into any contextual adaptations to the  
223 guidelines that may be necessary. This local literature would also be relevant for the  
224 consensus panel meeting to provide an overview of research on movement behaviours in  
225 early childhood in SA, since many of the consensus panel members did not necessarily have  
226 experience working in the field of movement behaviours and would not be familiar with  
227 local research. Comprehensive searches on PubMed, Africa Journals Online, and Africa Wide  
228 (EBSCOhost) databases for evidence published in the previous 10 years (prior to March  
229 2018) on physical activity, sedentary behaviour, screen time and sleep in children 0-5 years  
230 old from SA were conducted. Search parameters are included in Supplementary Table 3.

231

232

## 233 **Results**

### 234 ***Updates to systematic reviews***

235 The results of the WHO updated systematic reviews have been published elsewhere,<sup>11</sup> and a  
 236 summary of results is presented here. Physical activity was found to be positively associated  
 237 with lower adiposity (infants) and improved motor development (infants, toddlers, pre-  
 238 schoolers); cognitive development (infants, pre-schoolers); fitness (pre-schoolers);  
 239 bone/skeletal health (pre-schoolers); and cardiometabolic health (pre-schoolers). Higher  
 240 levels of sedentary behaviour were found to be associated with higher adiposity (infants,  
 241 toddlers, pre-schoolers); poorer motor development (toddlers); poorer cognitive  
 242 development (infants, toddlers, pre-schoolers); and poorer psychosocial health (pre-  
 243 schoolers). Shorter sleep duration was found to be associated with higher adiposity (pre-  
 244 schoolers); poorer emotional regulation (infants, toddlers, pre-schoolers); and poorer  
 245 cognitive development (pre-schoolers).

246

### 247 ***Narrative review of South African literature***

248 Overall, there was a paucity of literature describing the physical activity, sedentary  
 249 behaviour and sleep of 0-5 year old children in SA.<sup>8</sup> This was highlighted in the Healthy  
 250 Active Kids South Africa 2018 Report Card<sup>13</sup> There were a number of recent studies on  
 251 movement behaviours in this age group, and while these studies were done with relatively  
 252 small, localised samples, they represent the best available evidence. However, the  
 253 generalisability of these findings to all SA children is limited. These studies were presented  
 254 to the consensus panel and are summarised as follows.

255

### 256 **Physical activity**

257 In a study of infants and toddlers (3-24 months) using accelerometry, those aged 3 and 6  
 258 months were reported to spend 20 and 10 minutes in tummy time per day respectively.  
 259 Infants who were more mobile played more. Boys spent more time in higher intensity  
 260 physical activity and less time in lower intensity activity than girls; and time spent in higher  
 261 intensity activities was higher in the older age groups (controlling for BMI-z scores, weight  
 262 and length).<sup>14</sup>

263

264 Amongst preschool-aged children (3-5 years old) across income settings, objectively  
 265 measured physical activity was reported to be in excess of 400min/day, with all children  
 266 meeting the recommended 180min/day of total physical activity<sup>15</sup> – the Australian  
 267 recommendation (in 2011) when these data were published.<sup>16</sup> Further analyses of these  
 268 data (presented to the panel; being prepared for publication) indicate that for this sample,  
 269 average moderate- to vigorous-intensity physical activity (MVPA) was 124.4±37.5min/day  
 270 and total physical activity was 457.0±61.1min/day; 96.9% of children met current guidelines  
 271 published by the Canadians and Australians.<sup>2,3</sup> Boys were significantly more active than girls,  
 272 and urban high-income children were significantly less active than urban low-income and  
 273 rural low-income children. Similar findings have been reported with preschool-aged children  
 274 from another low-income, urban setting: 560.5±52.9min/day of total physical activity and  
 275 90.9±30.0min/day of MVPA (objectively measured), with 83% of children meeting current  
 276 guidelines.<sup>17</sup> Using direct observation at preschools, low-income urban children spent 11%  
 277 of their time in MVPA, which was more than the 8% observed in mid-/high-income  
 278 children.<sup>18</sup>

279

280 Various studies have looked at associations between physical activity and measures of  
 281 adiposity, and gross motor skills. In preschool-aged children from a low-income, rural  
 282 setting, children who were overweight/obese were almost 80% less likely to engage in  
 283 MVPA (directly observed) in the preschool setting.<sup>19</sup> This is similar to findings from a study  
 284 using the same methods with urban preschool children, although in this urban sample,  
 285 underweight children were also less likely to be active.<sup>18</sup> Amongst preschool children from  
 286 urban low- and high-income settings, being less physically active (objectively measured) has  
 287 been associated with thinness (prevalence of 19.4% in the total sample), but not  
 288 overweight/obesity; and MVPA was in fact positively associated with BMI and BMI-z scores  
 289 (mean BMI-z score  $-0.04 \pm 1.03$ ).<sup>20</sup> These studies highlight that undernutrition remains a  
 290 concern in SA, particularly in early childhood; and that in SA, stunting is a persistent issue.<sup>21</sup>  
 291 Although stunting has been found to have a limited effect on gross motor skills, it has a  
 292 more pronounced effect on cognitive development in early childhood.<sup>22</sup>

293

294 Gross motor skills were found to be good amongst 0-5 year old children in SA.<sup>23-27</sup> In the  
 295 study with preschool-aged children from a low-income, rural setting, better gross motor  
 296 skills (as measured by the Test of Gross Motor Development-Version 2, TGMD-2<sup>28</sup>) were  
 297 associated with objectively measured MVPA and vigorous-intensity physical activity. This  
 298 study also found that directly observed MVPA during preschool time was positively  
 299 associated with gross motor skills.<sup>19</sup> Another study conducted with preschool children from  
 300 low-income settings reported that components of cognitive development were positively  
 301 associated with gross motor skills (using the TGMD-2), but not with physical activity.<sup>27</sup>

302

303 With regards to contextual factors influencing physical activity in SA settings, safety has  
 304 been raised as a concern by parents, both in terms of crime and traffic safety.<sup>16,29</sup> However,  
 305 qualitative findings suggest that while safety is a perceived issue, it does not seem to stop  
 306 children from being very active or playing without supervision,<sup>16</sup> and children have been  
 307 observed implementing their own safety precautions during games where road traffic was  
 308 an issue.<sup>29</sup> The lack of resources and facilities, particularly in low-income settings, have also  
 309 been mentioned as a constraint to physical activity.<sup>16</sup> But again, these constraints, such as  
 310 the lack of conventional play equipment, have not always been observed to hinder play.<sup>29</sup>

311

### 312 *Sedentary behaviour*

313 A small number of studies have investigated time spent in sedentary behaviour, including  
 314 screen time. In the study on infants and toddlers mentioned above, 94% of children  
 315 exceeded the recommendation of no television time based on maternal-report, with a  
 316 median of 30min at 3-, 6- and 12- months old, and 25min at 18- months old. Total time  
 317 spent restrained per day varied between age groups, and at 3-, 6-, 12- and 18- months was  
 318 (median) 133, 150, 100, 75 min per day respectively. This included being strapped to the  
 319 back of a caregiver (median of 30min at 3-, 6- and 12- months old)<sup>14</sup> which during early  
 320 childhood is a common practice in SA and has been found to restrict opportunities to crawl,  
 321 impacting on neurological development.<sup>30,31</sup>

322

323 In the studies using direct observation, urban preschool children were found to spend 73%  
 324 of their time in preschool being sedentary.<sup>18</sup> Time spent sedentary was 71% in rural, low-  
 325 income preschools.<sup>19</sup> Other findings presented to the panel (paper in review) reported that  
 326 screen time, assessed using a parent questionnaire, was significantly higher in preschool-

327 aged children from urban high-income settings ( $1.71\pm 1.18\text{h/day}$ ) in comparison to urban  
 328 low-income ( $0.77\pm 0.90\text{h/day}$ ) and rural settings ( $0.45\pm 0.37\text{h/day}$ ). Overall, 81.9% met the  
 329 screen time guideline of  $<1\text{h/day}$ ,<sup>2,3</sup> but only 33.3% of the urban high-income children met  
 330 the guideline, versus 74.0% and 96.5% of low-income urban and rural children, respectively.  
 331 The low levels of screen time in the rural setting are most probably due to limited access to  
 332 screens (reported from questionnaire data). A high proportion (81.7%) of parents reported  
 333 that they believed their child's screen time would not affect his/her health, which highlights  
 334 the importance of educating parents about the risks of screen time.

335

336 *Sleep*

337 The infant and toddlers' study assessed nocturnal sleep using parent-completed sleep  
 338 diaries (measured as time-in-bed) and found that infants and toddlers aged 3 and 6 months  
 339 were getting 10.38h of time-in-bed on average (range 7.48h to 13.43h).<sup>14</sup> Although this does  
 340 not account for naps during the day, this is substantially less than what is recommended for  
 341 0-3-month-old infants (14-17h) and 4-11-month-old children (12-16h) in a 24h period.<sup>2,3</sup>

342

343 In the study of preschool children in a low-income, urban setting, objectively measured  
 344 nocturnal sleep duration was found to be low ( $9.28\pm 0.80\text{h/night}$ ), and although daytime  
 345 naps ( $1.42\pm 0.31\text{h}$ ) increased 24h sleep duration (to  $10.17\pm 0.71\text{h/night}$ ), 38% were still  
 346 classified as short sleepers according to current guidelines for preschool-aged children (10-  
 347  $13\text{h}^{2,3}$ ). Bedtimes were late in this sample of preschool children:  $21\text{h}29\pm 00\text{h}49$  on week  
 348 nights and  $21\text{h}57\pm 01\text{h}20$  on weekend nights. This study found that 54.9% of participants  
 349 complied with available physical activity and sleep guidelines (from Canada and Australia),  
 350 but found no associations found between sleep and adiposity variables.<sup>17</sup> One might  
 351 speculate that this was due to the limited variation in adiposity measures in this group.

352

353 In the study of preschool-aged children across settings, sleep was assessed using objective  
 354 measures, and these findings were presented to the panel (paper in preparation). Children  
 355 were reported to sleep for an average of  $10.48\pm 0.78\text{h/night}$ , and 73.7% met current sleep  
 356 guidelines. Urban low-income children slept significantly less than rural and high-income  
 357 children ( $9.91\pm 0.68\text{h/night}$  vs.  $10.76\pm 0.61\text{h/night}$  and  $10.76\pm 0.68\text{h/night}$  respectively).  
 358 Urban low-income children were 1.88 times less likely to meet sleep guidelines than urban  
 359 high-income children. For every 1h less sleep, children were 1.41 times more likely to fall  
 360 into a higher BMI-z quartile. In the parent questionnaire study mentioned above (presented  
 361 to the panel), parents reported that children slept  $11.6\pm 1.3\text{h/night}$ . Overall, 73.7% met the  
 362 sleep guideline. Few children (8.7%) slept  $<10\text{h/night}$ , and 9.4% slept  $>13\text{h/night}$ . Only  
 363 children from low-income urban (16.1%) and rural (7.1%) settings exceeded 13h/night.

364

365 An important contextual consideration for young children's sleep in SA is the sharing of beds  
 366 and/or rooms in low-income settings, particularly since the population density ranges  
 367 between 6000 and 40000 people/ $\text{km}^2$  in the areas included in the studies presented above.  
 368 <sup>32</sup> These areas are generally a mix of 'informal' housing, such as shacks, as well as brick and  
 369 cement houses, some of which are provided by the government to previously  
 370 disadvantaged individuals. These government houses are often, at best,  $45\text{m}^2$  in size, with  
 371 most houses being smaller than  $30\text{m}^2$ . They generally consist of a single open-plan room,  
 372 which functions as the bedroom, lounge and kitchen, making it less than ideal for sleeping.<sup>33</sup>

373



374 **8. Consensus panel meeting, and 9. ADOLOPMENT of recommendations from guidelines**

375 The consensus panel met on the 11<sup>th</sup>-12<sup>th</sup> of April 2018 in Cape Town, SA. The aims of the  
376 consensus panel meeting were to: 1) review, discuss, debate and interpret findings from the  
377 global and local systematic reviews; 2) review and adopt/adapt the preamble and  
378 recommendations from the Australian guidelines; 3) discuss the consultation with  
379 stakeholders; 4) discuss the launch and dissemination of the guidelines; and 5) identify  
380 research gaps. All these aims were achieved except for the identification of research gaps,  
381 as time did not allow for any substantial discussion of this point.

382

383 Overall, the consensus panel agreed that the recommendations (from the Australian  
384 guidelines) would be feasible and acceptable in SA, and there was consensus that such  
385 guidelines were relevant and important in SA. The Australian guidelines were largely  
386 adopted, and there were no suggestions to change the actual recommendations based on  
387 the available South African literature reviewed.

388

389 Suggestions for adaptation (modification) of the recommendations from the Australian early  
390 years' guidelines were mainly to the wording of the guidelines to make them more  
391 understandable for a wider South African audience, especially since English is not the home  
392 language of the majority of South Africans. The following changes were agreed on by the SA  
393 consensus panel:

- 394 • Refer to sedentary behaviour (only familiar to academics) as 'seated' or 'sitting  
395 behaviour'.  
396 • Replace 'restrained' with 'being strapped in and unable to move'.  
397 • Remove any references to car seats, since much effort is put into promoting the use of  
398 car seats in SA (many cannot afford them, and they are not commonly used). Any  
399 mention of reducing time in car seats could be open to misinterpretation.  
400 • Replace 'stroller' with 'pram', which is the more common term in SA.

401

402 There was also extensive discussion about the preamble and what this should include. All  
403 suggestions for the guidelines and preamble were recorded (by SAT), and collated (by SAT,  
404 CED and ADO) into the first draft.

405

406 Following the example of the Australian guidelines, it was agreed that the stakeholder  
407 consultation would involve the distribution of an online survey, for those with access to  
408 internet; and that focus groups would be conducted with stakeholder groups for whom  
409 internet access is a challenge. Target groups for the online survey that were agreed by the  
410 panel included parents/caregivers, expectant mothers, ECD practitioners, health  
411 professionals, academics, and government representatives. For the focus groups, it was  
412 agreed that these should target parents/caregivers, ECD practitioners and community  
413 workers in low-income settings. An additional suggestion was made by the national  
414 government representative on the panel to arrange a meeting with national government  
415 and non-governmental representatives in ECD.

416

417 With regards to dissemination, language was discussed as a key issue (SA has 11 official  
418 languages), and low levels of literacy are common in low-income settings. The advice from  
419 those who had experience with translating documents for national dissemination was that  
420 the main guidelines (text) document would not be understandable to a large proportion of

421 the population (but would still be necessary to produce), and that those who would read it  
422 would be able to understand it in English. Any translation that should be done would need  
423 to include all the 10 other official languages, in order to be inclusive of all language groups.  
424 It was strongly suggested that the guidelines be disseminated in a form that was as visual as  
425 possible. This should include pictures that are simple and culturally appropriate for all SA  
426 children, and should depict activities that do not require significant resources. Another  
427 suggestion from panel members was to have some practical suggestions of how these  
428 guidelines could be achieved.

429

430 Panel members discussed ways in which the guidelines could be disseminated through their  
431 existing networks, and that relevant media channels for dissemination should be explored,  
432 where feasible and affordable, given the funding available. All were in agreement that an  
433 event should be arranged to launch the guidelines.

434

### 435 **10. Drafting of SA guidelines**

436 In the week subsequent to the consensus panel meeting, the first draft of the guidelines and  
437 preamble were circulated to the panel, and they were asked to provide input within 2  
438 weeks. All comments were collated (by SAT, CED and ADO) in preparation for stakeholder  
439 consultation.

440

### 441 **11. Stakeholder consultation**

442 The stakeholder consultation process and results are described elsewhere (Tomaz et al,  
443 2019). This process included an online survey (completed n=197 participants), nine focus  
444 groups with parents and caregivers, ECD practitioners and community health workers  
445 (n=70), and a meeting with stakeholders from government and non-government  
446 organisations (n=15). Overall, stakeholders agreed with the guidelines although issues  
447 including, but not limited to, safety and nutrition of children were highlighted. Training and  
448 provision of educational materials were identified as key in the dissemination and  
449 implementation of the guidelines.

450

### 451 **12. Amend guidelines based on stakeholder input**

452 Various amendments to the preamble and guidelines were suggested during the  
453 stakeholder consultation process, and these are also described in detail in Tomaz et al 2019.  
454 The final preamble and guidelines are provided as Figure 2. An infographic, provided as  
455 Figure 3, was designed to depict the recommendations within the guidelines. The  
456 infographic was reviewed and modified (by CED, SAT, CJC, DER) to ensure it was appropriate  
457 and comprehensible. Particular attention was paid to the neutrality of the pictures within  
458 the infographic, from the perspectives of gender, ethnicity, and socioeconomics.

459

460 [Insert Figures 2 and 3 here]

461

462 Based on the suggestion for including practical suggestions of how to achieve these  
463 guidelines for key stakeholder groups, two additional documents were developed amongst  
464 panel members (coordinated by SAT): 'Using the guidelines at home: Some tips for parents',  
465 and 'Using the guidelines at ECD facilities: Some tips for practitioners.' These are provided  
466 as Figures 4 and 5 respectively. Colour versions of all documents are available at:

467 <http://www.laureus.co.za/moving-playing-sleeping-starting-early-with-healthy-habits/>

468 [Insert Figures 4 and 5 here]

469

### 470 **13. Launch and disseminate final guidelines**

471 The SA 24-hour movement guidelines for birth to five years were launched on the 4<sup>th</sup> of  
 472 December 2018 at the Nelson Mandela Children’s Fund Head Office in Johannesburg. The  
 473 launch was attended by representatives of national government (Departments of Basic  
 474 Education, and Health), non-governmental organisations, the media, funding partners, the  
 475 health sector, and academia. A preschool from a low-income community was also invited to  
 476 attend, so that the guidelines were launched not just ‘about’ children, but ‘with’ them as  
 477 well. Short addresses were provided by the Programme Specialist: Child survival and  
 478 development at the Nelson Mandela Children’s Fund, a representative from the Department  
 479 of Health (Child, Youth and School Health Directorate), an Ambassador for the Laureus Sport  
 480 for Good Foundation South Africa, the chair of the SA guideline consensus panel (CED), and  
 481 the Centre Manager of the DST-NRF Centre of Excellence in Human Development. A panel  
 482 discussion (with audience participation) was also held, and panel members included the  
 483 Director of ECD at the National Department of Basic Education, a trustee of the Laureus  
 484 Sport for Good Foundation South Africa, a paediatrician (TN), and the Marketing and  
 485 Communications Manager at The Innovation Edge.

486

487 Details of the media dissemination associated with the launch are provided in  
 488 Supplementary Table 4.

489

490 Further plans are underway for wider dissemination of the guidelines at a community level,  
 491 particularly within low-income settings, in partnership with community-based organisations  
 492 that work with parents/caregivers and ECD practitioners around SA.

493

### 494 **Discussion**

495 To our knowledge, SA is the first low- and middle-income country (LMIC) to produce 24-  
 496 hour movement guidelines for this age group. The relatively novel GRADE-ADOLOPMENT  
 497 approach, in a slightly adapted format, proved to be a feasible and appropriate approach for  
 498 the development of the SA 24-hour movement guidelines for birth to five years.

499 Furthermore, SA was able to retain the integrated nature of these guidelines and present  
 500 recommendations for physical activity, sedentary behaviour (including screen time) and  
 501 sleep in one set of guidelines. Adaptations to the Australian guidelines were relatively  
 502 minimal, and related mainly to ensuring the content was locally relevant and  
 503 understandable for end users. Along with these efforts to contextualise the guidelines for  
 504 SA, it is also evident that the process of development had additional value for creating a  
 505 sense of local ownership of the guidelines. These lessons learnt are important for any future  
 506 movement guideline development in SA, as well for other LMICs that are considering  
 507 developing their own guidelines for 24-hour movement behaviours in the early years, or in  
 508 other age groups.

509

510 The use of the updated systematic reviews made available by the WHO is a strength of this  
 511 process. The novelty of this process in SA is another strength of this initiative, as well the  
 512 range of stakeholders who were involved in the process. The ‘ownership’ of these guidelines  
 513 by all stakeholders, rather than a particular institution or government department, is also a  
 514 strength. Although the widespread adoption of these guidelines is an ongoing process, this

515 at least suggests an approach that creates a favourable environment for the future  
516 development of evidence-based guidelines in SA.

517

518 A weakness was the limited availability of SA literature upon which to adapt the guidelines,  
519 although this is improving. Furthermore, in comparison with other high-income countries  
520 who have engaged in guideline initiatives, the SA initiative was smaller in scope, and had  
521 fewer human resources dedicated to the project (linked to limited funding availability).  
522 Despite these constraints, the SA 24-hour movement guidelines for birth to five years are an  
523 example of a successful and pragmatic application of the GRADE-ADOLOPMENT approach.  
524 In this LMIC, where early years movement behaviour research is limited in comparison to  
525 high-income countries, this guideline development process translated global and local  
526 evidence, and brought together a range of academic and non-academic stakeholders to  
527 place movement behaviours in the broader context of early childhood development, which  
528 is frequently stated as a priority in SA. This engagement provides a platform for future  
529 activities and partnerships to positively influence research and practice in this field in SA.

530

### 531 **Acknowledgements**

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536 Excellence in Human Development, and the launch of the guidelines was hosted and funded  
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538 University of South Africa and the National Department of Basic Education for their  
539 assistance with the translation of the guideline material, as well as Lisa Fincham and  
540 Catherine Lacey for their input in developing the two documents of practical suggestions for  
541 parents and practitioners.

542

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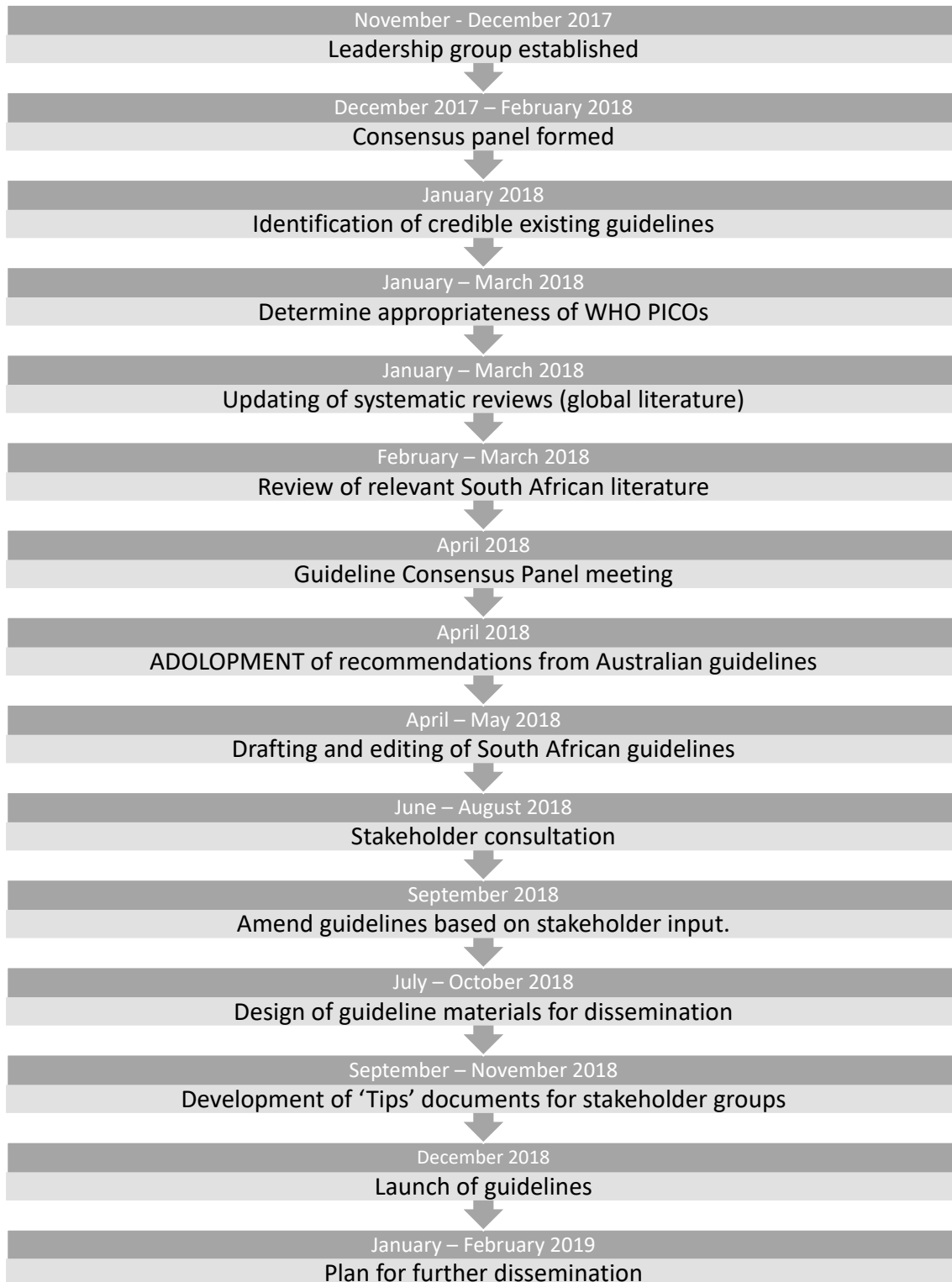
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## SA 24-hour movement guidelines for birth to five years



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**Figure 1: GRADE-ADOLOPMENT process**



## SOUTH AFRICAN 24-HOUR MOVEMENT GUIDELINES FOR BIRTH TO FIVE YEARS

An integration of physical activity, sitting behaviour, screen time and sleep

### Why are 24-hour movement guidelines important for children from birth to 5 years?

These are the first guidelines targeting physical activity, sitting behaviour, screen time and sleep in South African children. They have been developed in response to the research that shows how these movement behaviours are linked to healthy growth and physical development, as well as cognitive, social and emotional development in children from birth to 5 years.

These guidelines recommend that children from birth to 5 years should participate in a range of play-based and structured physical activities that are appropriate for their age and ability, and that are fun and safe. Children should be encouraged to do these activities independently as well as with adults and other children. Caregivers should engage in activities that are loving, and involve play and talking with children.

These guidelines also emphasise that the quality of what is done when sitting matters. For children younger than 2 years, screen time is NOT recommended. For children aged 2-5 years, sitting activities that are screen-based should be limited. The quality of sleep in children from birth to 5 years is also important, and screen time should be avoided before bed. Family members should be encouraged to avoid using screens in shared sleeping areas, especially while children are falling asleep.

Children from birth to 5 years who receive support to meet these movement guidelines are likely to grow up healthier, fitter and stronger. They may also have greater motor skill abilities, be more prepared for school, manage their feelings better, and enjoy life more. The benefits of following these guidelines are greater than the potential harms.

### Who are these guidelines for?

These guidelines are for those who have an interest in the health and development of all children from birth to 5 years, including parents and family, educators, caregivers, health professionals, and community workers. These guidelines should be implemented in homes, early childhood development programmes and centres, or any setting where children may engage in these movement behaviours. They apply to all apparently healthy children from birth to 5 years; children of all abilities, cultural ethnicities, language backgrounds, income settings, and living in all parts of South Africa. For children with a medical condition, it would be best to first consult with a health care professional about how these guidelines should be adapted to suit their specific needs and abilities.



### How do these guidelines link to existing policy documents in South Africa?

**Road to Health book:** Following these guidelines can help children achieve the developmental milestones outlined in the Road to Health book. Both documents recognise the importance of love, play and talking to stimulate children's development and learning from birth.

**Paediatric Food-based Dietary Guidelines:** Both guidelines promote health, growth and development of children.

**National Integrated Early Childhood Development Policy 2015:** The principles in these guidelines can improve the quality of early childhood development programmes. Both documents recognise the importance of play for development and learning, and the role of parents in children's early development.

**National Curriculum Framework for Children from Birth to Four:** These guidelines support the themes of learning and development, strong connections with adults, and the child being a competent person. Following these guidelines contributes to building a strong foundation for lifelong learning in the child.

These guidelines are based on the best available research, expert consensus, stakeholder consultation, and consideration of what is regarded to be important, applicable, feasible and equitable across all South African settings. Furthermore, they are consistent with World Health Organization guidelines.

Further details on how to achieve these guidelines are available at [www.laureus.co.za](http://www.laureus.co.za).

## A HEALTHY 24-HOUR DAY INCLUDES:

### BABIES (BIRTH TO 1 YEAR OLD)

#### Moving

Being physically active several times a day in a variety of ways through interactive floor-based play, including crawling. For babies not yet mobile, this includes at least 30 minutes of tummy time spread throughout the day while awake, and other movements such as reaching and grasping.

#### Sitting

Engaging in stimulating activities with a caregiver, such as playing with safe objects and toys, having baby conversations, singing, and storytelling. Babies should NOT be strapped in and unable to move for more than 1 hour at a time (e.g., in a pram, high chair, or on a caregiver's back or chest) while awake. Screen time is NOT recommended.

#### Sleeping

14 to 17 hours (for babies aged 0-3 months) and 12 to 16 hours (for babies aged 4-11 months) of good quality sleep, including naps in the day. Sleeping may occur while a baby is strapped to a caregiver, or while a baby is being held.

Screens include televisions, cell phones, tablets, video games and computers.

### TODDLERS (1 AND 2 YEARS OLD)

#### Moving

At least 180 minutes spent in a variety of physical activities including energetic play, spread throughout the day; more is better.

#### Sitting

Engaging in activities that promote development such as reading, singing, games with blocks, puzzles, and storytelling with a caregiver. Toddlers should NOT be strapped in and unable to move for more than 1 hour at a time (e.g., in a pram, high chair or strapped on a caregiver's back or chest), and should not sit for extended periods. For toddlers younger than 2 years, screen time is NOT recommended. For toddlers aged 2 years, screen time should be no more than 1 hour; less is better.

#### Sleeping

11 to 14 hours of good quality sleep, including naps in the day, with consistent sleep and wake-up times.

### PRE-SCHOOLERS (3, 4 AND 5 YEARS OLD)

#### Moving

At least 180 minutes spent in a variety of physical activities, of which at least 60 minutes is energetic play that raises their heart rate and makes them 'huff and puff' (e.g. running, jumping, dancing), spread throughout the day; more is better.

#### Sitting

Engaging in activities such as reading, singing, puzzles, arts and crafts, and storytelling with a caregiver and other children. Pre-schoolers should NOT be strapped in and unable to move for more than 1 hour at a time and should not sit for extended periods. Screen time should be no more than 1 hour per day; less is better.

#### Sleeping

10 to 13 hours of good quality sleep, which may include a nap, with consistent sleep and wake-up times.

Helping children from birth to 5 years to stick to these guidelines may be challenging at times! For children who are not meeting these guidelines, it is recommended that small changes are made to help them start working towards what is stated in these guidelines.

To further support children from birth to 5 years in their movement behaviours over a 24-hour day, encourage them to do more energetic play, choose age-appropriate, interactive sitting activities instead of sitting or lying in front of a screen, and to get enough sleep. This will help them enjoy greater benefits to their health and development.

"Our children are the rock on which our future will be built, our greatest asset as a nation." Nelson Mandela



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Figure 2: Final preamble and guidelines

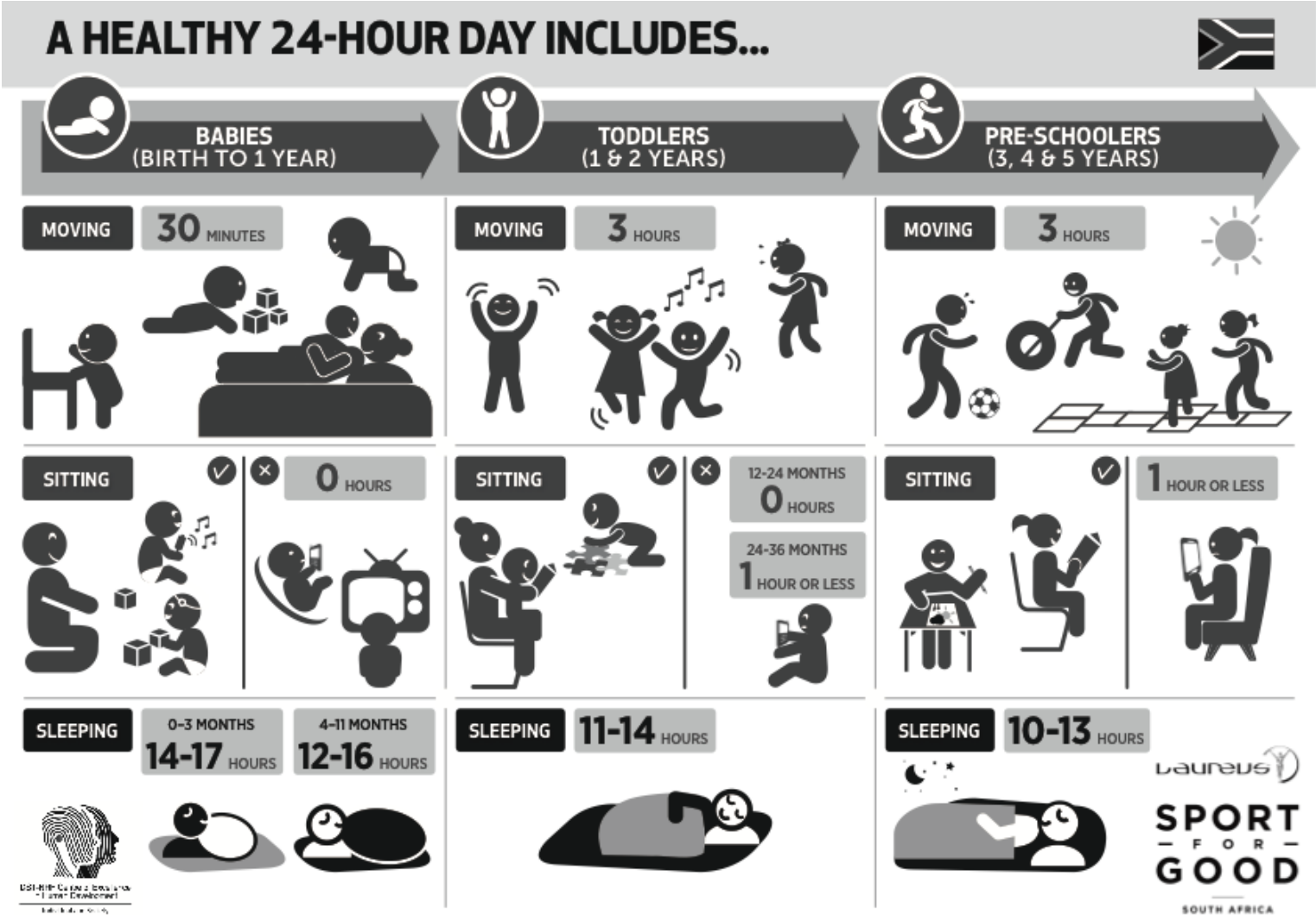


Figure 3: Guidelines infographic

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## SOUTH AFRICAN 24-HOUR MOVEMENT GUIDELINES FOR BIRTH TO FIVE YEARS

An integration of physical activity, sitting behaviour, screen time and sleep



### Using the guidelines at home: Some tips for parents



#### BABIES (BIRTH TO 1 YEAR OLD)

##### Moving

- ✓ For babies not yet crawling, tummy time should take place for **30 minutes** per day on a safe, flat surface, e.g. a soft blanket on the floor, and should be supervised. For babies who struggle during tummy time (e.g. they cry after a short while), tummy time can be done a few times every day in shorter bouts, e.g. for 5 to 10 minutes at a time.
- ✓ Make tummy time more **fun and stimulating** for babies by holding or scattering age-appropriate toys (e.g. rattles) just out of their reach to encourage them to move, lift their heads up and look around them. This is good for babies' physical development, and helps them to build their strength and get ready to crawl while learning about their environment.
- ✓ For babies who can crawl, create obstacle courses with safe, soft toys like teddy bears or even bigger obstacles like pillows and blankets.

##### Sitting

- ✓ Instead of screen time, rather read, tell stories or sing to your baby. These activities support their development and will help you connect with them.
- ✓ When it is necessary to have your baby strapped in while they are awake (e.g. in a pram), try your best to give them safe tummy time breaks every hour between being strapped in.

##### Sleeping

- ✓ Establishing regular bedtime habits (e.g. calming babies down in a quiet room, singing to babies before sleeping) may help babies get the sleep they need, and help them to sleep better.



#### TODDLERS (1 AND 2 YEARS OLD)

##### Moving

- ✓ Great activities to get your toddler moving and playing for **3 hours** every day can include games and activities such as 'hide and seek', dancing to music, jumping and climbing. Teaching children to move, play and do activities that take place over, under and around obstacles (e.g. chairs, jungle gym equipment) is good for their physical and brain development.
- ✓ Toddlers should play with toys (e.g. balls, bean bags) as they start learning skills like kicking, catching and throwing. Start with bigger balls (e.g. blow-up beach balls or soccer balls) as they are easier for toddlers to manage, and progress to smaller balls (e.g. tennis balls).
- ✓ Playing games and practicing skills with older siblings or a parent helps toddlers learn and develop skills, and helps develop healthy family relationships.

##### Sitting

- ✓ Toddlers younger than 2 years old should not be allowed to play with screens. In toddlers already 2 years old, establish some screen time **rules** (e.g. **no** screen time without adult supervision, **no** screen time during meal times). **Try your best to stick to these rules!**
- ✓ Unsupervised screen time can lead to language delays and reduce toddlers' ability to pay attention.

##### Sleeping

- ✓ Establish a sleep routine with your toddler by having consistent bedtimes at night and consistent wake up times in the morning.
- ✓ Avoid screen time before bed and rather read a bedtime story to your toddler. Singing and telling stories (make-believe or real) can be included in your toddler's bedtime routine.



#### PRE-SCHOOLERS (3, 4 AND 5 YEARS OLD)

##### Moving

- ✓ Pre-schoolers can move for **3 hours** every day by doing **fun** activities like dancing, playing with different sized balls, and playing games like 'follow the leader' and 'hide and seek'.
- ✓ Doing these activities alone, with older siblings or with a parent are good for pre-schoolers' physical development and gross motor skills.
- ✓ Pre-schoolers need **1 hour** per day of **energetic play**. Running, jumping and energetic games will help their hearts, bones and muscles get stronger.

##### Sitting

- ✓ Reduce screen time to **less than 1 hour** per day by setting screen time **rules** at home (as you would with a toddler), e.g. **no** screens at the dinner table, **no** screens allowed in the bedroom, 15 minutes of screen time only allowed **after energetic play** outside. **Try your best to stick to these rules!**
- ✓ Encourage sitting activities that will help pre-schoolers get ready for school (e.g. drawing, painting, doing puzzles, playing with dough and different foods, and playing 'make believe').

##### Sleeping

- ✓ Establish a sleep routine and ensure that pre-schoolers have a safe, quiet place to sleep well. Well-rested pre-schoolers are more likely to behave better and concentrate at preschool.
- ✓ Avoid screen time before bed as this may make it difficult for pre-schoolers to fall asleep. Rather read to your pre-schooler, or get them to talk about their day at preschool.



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Figure 4: Using the guidelines at home: Some tips for parents

## SOUTH AFRICAN 24-HOUR MOVEMENT GUIDELINES FOR BIRTH TO FIVE YEARS

An integration of physical activity, sitting behaviour, screen time and sleep



### Using the guidelines at early childhood development (ECD) facilities: Some tips for practitioners

#### BABIES (BIRTH TO 1 YEAR OLD)

##### Moving

- ✓ During the day at the ECD centre, including some tummy time while babies are awake helps babies' physical development by helping them get strong and ready to crawl.
- ✓ Tummy time should take place on a flat, safe surface and while supervised. A soft blanket on the floor with other babies and some soft toys is a great way to get babies moving and interacting, and to make the tummy time **fun!**
- ✓ For babies who struggle during tummy time (e.g. they cry after a short while), tummy time can be done for just a few minutes at a time.
- ✓ For crawling babies, prepare a safe area to move and play with each other. Scattering age-appropriate toys like teddy bears and rattles, as well as blankets and pillows will encourage the babies to crawl and play while on their tummies. This helps the babies' physical development.

##### Sitting

- ✓ If you work in an ECD centre with a TV, it is best to not let the babies watch any TV. Better activities for babies include singing, listening to age-appropriate music and story-telling.

##### Sleeping

- ✓ Babies need sleep to help them develop and to grow. It is best for ECD centres to have a set sleeping time for babies.
- ✓ Ensure that sleeping areas in the ECD centre are safe and quiet, and that sleep times are supervised by an ECD practitioner.

#### TODDLERS (1 AND 2 YEARS OLD)

##### Moving

- ✓ Toddlers should be encouraged to move and play during their time at home **and** at ECD centres. Play areas at the ECD centre should be safe, whether it is inside or outside.
- ✓ Toddlers should spend time playing with other toddlers, and they should play **fun** games like 'on-on' and 'hide and seek'. To help physical and brain development, teach toddlers to play and do activities that take place over, under, behind and around obstacles (e.g. chairs, jungle gym equipment).
- ✓ Toddlers also benefit from playing games (e.g. 'Simon Says') and doing activities that are guided by an ECD practitioner. Ball games and activities that teach toddlers skills like catching, kicking, bouncing and jumping are great! Try your best to make sure every toddler in the class gets a chance to play.

##### Sitting

- ✓ If you work in an ECD centre with a TV, try your best to keep the toddlers away from the TV. Also keep other screens like cell phones and tablets out of toddlers' reach.
- ✓ Story-telling, playing with blocks, doing puzzles and reading are excellent for toddlers' development, and are good ways to keep a group of toddlers busy!

##### Sleeping

- ✓ Like babies, toddlers need a lot of sleep and some of this sleep will take place in the ECD centre.
- ✓ Sleep routines are very important in toddlers. Keep an eye on toddlers who are unusually tired during the day at the ECD centre. If necessary, chat with toddlers' parents about the importance of bedtime routines.

#### PRE-SCHOOLERS (3, 4 AND 5 YEARS OLD)

##### Moving

- ✓ Like toddlers, pre-schoolers should be active at home **and** at ECD centres. Pre-schoolers should be active indoors and outdoors (where possible), and should play with other pre-schoolers too! Playing games like 'follow the leader', 'hide and seek' and 'on-on' are good for pre-schooler's physical and social development.
- ✓ As an ECD practitioner, you can help develop some budding sports stars! Helping children learn ball skills such as throwing, kicking and bouncing balls; balancing skills such as standing like a flamingo; or movement skills like jumping and galloping are excellent ways to improve the growth and development of pre-schoolers.

##### Sitting

- ✓ Some TV programmes encourage learning in pre-schoolers (e.g. 'Takalani Sesame'), but it may be helpful to have screen time **rules**, since too much screen time (more than 1 hour) can negatively affect children's readiness for school.
- ✓ Rather get pre-schoolers to do sitting activities that will help prepare them for school (e.g. playing 'make believe' games, drawing, and painting).

##### Sleeping

- ✓ Pre-schoolers who sleep well **and** get enough sleep may do better at preschool. Most of pre-schoolers' sleep should be at night time.
- ✓ Encourage parents to send pre-schoolers to bed earlier at night if a pre-schooler is sleepy during the day at an ECD centre.



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Figure 5: Using the guidelines at ECD facilities: Some tips for practitioners