

# Certification of sun protection practices in a German child day-care centre improves children's sun protection – the 'SunPass' pilot study

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## Summary

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### Conflicts of interest

C.P. has acted as a paid consultant for the European Skin Cancer Foundation; E.S. has acted as a paid consultant to Meda; Mawing, Almirall; Spirig; Heidelberg Pharma; Intendis and has received funding for research carried out in this work; All remaining authors declare no conflicts of interests.

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**Background** Nonmelanoma skin cancer (NMSC) and malignant melanoma (CMM) are among the most common malignancies in the white population. The major risk factor for those malignancies is ultraviolet radiation (UV) causing directly DNA damage and promoting the development of skin cancer. It is suggested that the exposure to UV during childhood elevates an individual's lifetime risk of developing skin cancer more than exposure in adulthood. Since an increasing number of children spend the time of the most intense UV in a day-care centre, it seems an excellent place for establishing primary skin cancer prevention. Important targets are staff members and parents of the day-care centre, since sun protection of children depends directly on their knowledge and their attitude towards sun protection practices.

**Objectives** To establish a feasible certification program for sun protection in a German child day-care centre, for a better sun protection of the children and the reduction of skin cancer incidence in the long term.

**Methods** Initially sun protection practices of the centre at baseline were assessed. A written sun protection policy was developed in consultation with all members of the day-care centre as basis for certification. It was followed by training sessions for staff members ( $n = 12$ ) and parents ( $n = 46$ ). After a fixed period of time the final assessment of the child day-care centre was conducted and the centre then was certified for improved sun protection practices and better protection of the children. The primary assessed outcomes were the gain in knowledge of staff members and parents after the training sessions, the number of children wearing a hat when playing outside, the use of sunscreen and the percentage of shaded areas on the playground. **Results** Sun protection was an issue more discussed during the time of intervention than before. Staff members ( $n = 12$ ) and parents ( $n = 27$ ) had a significant gain in knowledge (staff members:  $P = 0.002$ ; parents:  $P = 0.001$ ) concerning sun related issues. The number of children wearing a hat increased from 13.2% to 73%. The sunscreen use increased, 58.8% of staff members reported a more regular application of sunscreen to the children. There was a higher percentage of shaded area on the playground (70–80% before intervention, 90% after intervention). The intervention failed in keeping the children inside during the most intense UV and in educating the staff members to be a convincing example of sun protection by wearing appropriate clothes.

**Conclusions** The intervention showed that the introduction of a simple certification program including a written sun protection policy and training sessions for staff members and parents helps to improve children's sun protection. We suggest that a certificate for adequate sun protection acts as a motivating factor. It seems important to refresh sun protection practices each year by repeating training sessions and reviewing the sun protection policy.

## Introduction

Nonmelanoma skin cancer and malignant melanoma belong to the most common malignancies in the white population.<sup>1</sup> In Europe, U.S.A., Canada and Australia the average annual increase of nonmelanoma skin cancer in the white population has been 3–8% since the 1960s.<sup>2</sup> The incidence of malignant melanoma between the 1960s and the 1980s had an average annual increase of 3–7%.<sup>3</sup> Sunlight exposure is generally accepted to be the most important environmental risk factor for the disease.<sup>4</sup> It has been a controversy, if there exist a critical period of life, in which sun exposure increases the risk of skin cancer more than in others. It was found that subjects with chronic sun exposure or frequent, severe sunburns in childhood had an increased risk of basal cell carcinoma and squamous cell carcinoma.<sup>5,6</sup> In case of malignant melanoma high levels of sunlight in childhood with subsequent sunburn seem to be a strong environmental risk factor,<sup>7</sup> especially in individuals with fairer skin types,<sup>8</sup> (I or II after Fitzpatrick),<sup>9</sup> and intermittent sun exposure. Among others, these findings are based on migration studies which showed that people immigrating in childhood had a risk of malignant melanoma similar to that of native residents in the sunny country.<sup>10</sup> On the other hand, there are studies which show the same odds ratio for sunburns in childhood and adulthood<sup>11</sup> or rather a synergistic effect of sun exposure in adult- and childhood on the risk of malignant melanoma.<sup>12</sup> Nevertheless the rising incidence of skin cancer and the clear association to sunburn demonstrate an urgent wake-up call for action. Since day-care centers supervise children during the hours of the most intense and potentially most harmful UV, the knowledge and attitudes of staff members greatly affect the children's prospective to sun exposure.<sup>13</sup>

Another aspect is the fact, that the earlier a habit is established to an individual, the more likely it is to maintain that habit later in adulthood.<sup>14</sup> Therefore, day-care centers are excellent places to implement a feasible program of primary skin cancer prevention. Despite these facts there exist an astonishing low number of interventional studies for primary prevention of skin cancer in child day-care centers in Europe. One interventional study in German day-care centers is known which tested the impact of education and free sunscreen on sun-protection habits and the development of melanocytic nevi of children.<sup>15</sup> Estimates from a sample of parents in France showed, that 35–45% of the children 3 years old and 13–14 years old spend more than 15 h per week outside in swimming suits.<sup>16</sup> Thirty-eight per cent of British parents reported that their preadolescent children had been burnt at least once in the past (13% three or more times).<sup>17</sup> Fifty-eight per cent of the French parents reported at least one light sunburn and 10% at least one severe sunburn on their infants and young children.<sup>16</sup> These statistics give evidence for a clear UV-overexposure of children in Europe. In Australia, the country with the highest skin cancer incidence of the world,<sup>18</sup> there exist national-wide successful sun-protection campaigns, such as the multimedia SunSmart campaign, which was

launched late in 1988 and which was directed especially to children and adolescents regarding their behaviour in the sun. Later on, Australian day-care centers received the possibility to become 'SunSmart' by applying a standardised sun protection policy. In Germany, to our knowledge, there are no such national-wide organised programs which institutionalize sun-protection practices in child day-care centers.

## Materials and methods

The intervention was conducted from April 2008 until June 2009 in a voluntary child day-care centre with about 150 children at the age of 0–6 years. The child day-care centre INA.KINDER.GARTEN was associated to the Rudolf-Virchow university-hospital of the Charité Berlin, Germany. The baseline data for the intervention included the assessment of already established sun protection practices of the day-care centre and was set at the beginning (July 2008). It was carried out by a member of the certification committee via personal, unexpected visits on five different weekdays. All visits were made on sunny, warm days. The use of sunscreen, the number of children wearing a hat and the percentage of shaded area in the playground was observed. A written sun protection policy was developed in consultation with all members of the day-care centre and the medical staff of the certification committee. It was in accordance with the guidelines for sun protection policies of the Cancer Council Victoria, Australia (March 2008). It contained nine items to be fulfilled by the day-care centre to attain certification and was published on the blackboard of the centre. Training sessions of 90 min for staff members ( $n = 12$ ) and parents ( $n = 46$ ) were conducted by a professional dermatologist. They included issues such as the risks of excessive sun exposure and the ways to protect the skin. The lecture was followed by a group discussion about personal experiences with excessive sun exposure.

The gain in knowledge was quantified by a pre- and post-test before and after the training session, including eleven multiple choice questions. The parents received a leaflet with information about the intervention and the most important details about the danger of UV as well as practical advices to protect themselves and their children. Also a sample of a liposomal based sunscreen was distributed. Further a presentation on sun protection was designed for the centre's director to take over staff education in the next years.

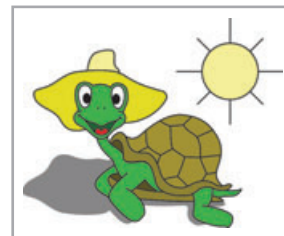


Fig 1. 'Paul', the mascot that reinforced sun protection messages throughout intervention. With kind permission from the European Skin Cancer Foundation and C. Parpart

A mascot, the turtle 'Paul' (Fig. 1), was developed for the children to convey and reinforce sun-safety messages throughout the intervention. Posters with a cartoon of the mascot's adventures in the sun (Fig. 4) and with the most important sun-protection practices were distributed in the day-care centre and discussed with the children. The actual UV-Index was released daily by the director of the day-care centre to inform about the current intensity of UV. Following the known recommendations of the World Health Organisation (WHO) concerning the UV-Index, a UV-Index from three onwards was set as sign for the full application of sun-safety practices in the day-care centre. The final assessment was conducted in June 2009. The day-care centre was visited unexpectedly on five different weekdays (June 2009), which were all sunny and warm, and the use of sunscreen, the number of children wearing a hat and the percentage of shaded areas in the playground was observed.

At the end of intervention a questionnaire for staff members and parents was distributed to evaluate the intervention and the certification for improved sun-protection practices was handed over. The present intervention did not assess the effect of the mascot's finger puppet and the cartoons on the gain in knowledge of the children regarding sun related issues.

Descriptive statistics (absolute and relative frequencies) were used for the description of observational results in the study group before and after intervention and for the questionnaire of staff members and parents. Pre-post comparisons were made using Wilcoxon signed rank test.

Our study was exempt from ethical committee's approval because no personal data or personal examinations were involved. Only training sessions and questionnaires on a voluntary base were performed.

## Results

### Sun protection policy

During intervention the sun protection policy was published on the blackboard of the day-care centre. The policy seemed to have more relevance to staff members, since 76.4% of them read the sun protection policy and knew at least four of the nine listed items. Organizational items concerning concrete changes in sun protection practices were more often remembered by the staff than items concerning role modelling of staff members. Of the parents, only 41.6% read the sun protection policy published on the blackboard. Only 13.8% remembered any of the policy's items.

### Training session

Pre-post comparisons were made using Wilcoxon signed rank test. There was a significant gain in knowledge in the group of staff members ( $n = 12$ ,  $P = 0.002$ ) and in the group of parents ( $n = 46$ ). Seven persons in the group of parents were excluded of statistical analysis since no post-test was conducted, 12 had further been excluded since classification to

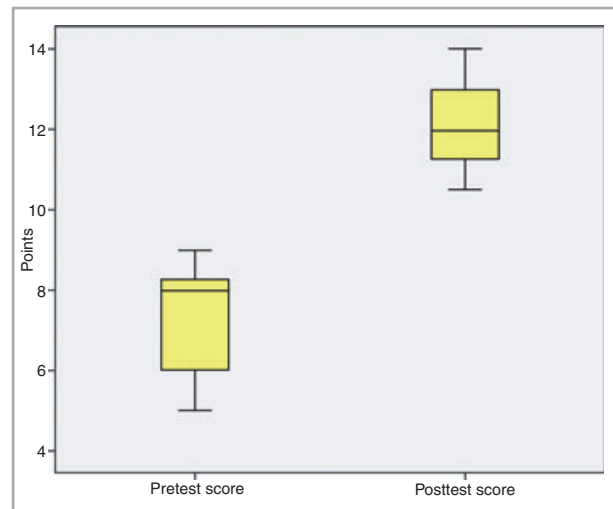


Fig 2. Boxplot of pretest and post-tests scores of staff members at the child day-care center ( $n = 12$ ).

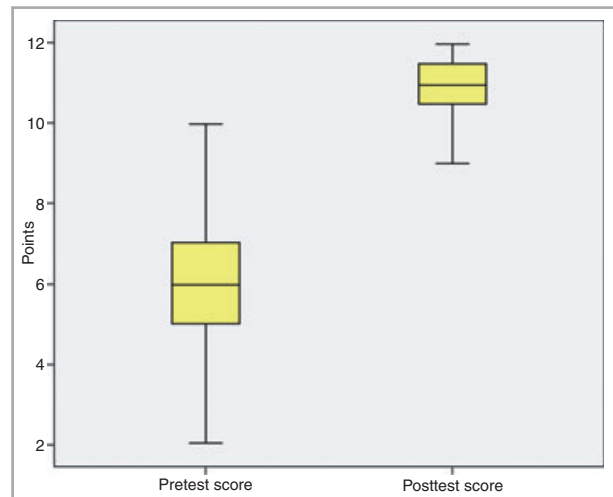


Fig 3. Boxplot of pretest and post-test scores of parents who's child attends day-care centre ( $n = 27$ ).

pre- and post-test was impossible. The results of 27 persons therefore were included in statistical analysis and showed a significant gain in knowledge ( $P = 0.001$ ) of the tested objects. As shown in Figures 2 and 3 the average of reached points in the group of staff members was 8 of 14 points in the pretest and 12 of 14 in the post-test. In the group of parents the average of reached points was 6 of 12 in the pretest and 11 of 12 points in the post-test.

### Leaflet for parents

Sixty-six per cent of the parents read the leaflet. 69.4% of the parents reported that the lecture of the leaflet improved their sun protection practices towards the own child. After lecture, 41.4% reported to avoid direct sun more often, 58.3% use



**Fig 4.** Paul is happy about high temperatures on the thermometer and sunny weather. Paul on the way to the playing ground, loaded with all his toys. Paul realizes that the sun is very strong and that he is not well protected. He sweats. Paul gazes at himself in the mirror and sees that his skin is all red because of a heavy sunburn. Paul has to stay in bed and dreams about everything he will use for sun protection next time when playing outside in the sun. Paul is happy playing with his toys, protected by a big hat, sunscreen and a large tree. With kind permission from the European Skin Cancer Foundation.

sunscreen more often and 44.4% report to put the child a hat on more often. 33.3% report to put the child a long sleeved shirt on more often.

**‘Paul’, the mascot**

The impact of the mascot on the gain in knowledge of the children was not assessed in our study. Nevertheless 82.3% of staff members thought that the children learned something about sun protection by ‘Paul’, the mascot, and his adventures in the sun. With the finger puppet and the posters of ‘Paul’ (Fig. 4) and his negative

adventures in the sun the staff members demonstrated the children the negative consequences of an overexposure to UV.

**Questionnaire after intervention**

In Tables 1 and 2 the frequencies of all answers of staff members (n = 17) and parents (n = 36) are shown. Descriptive statistics (relative and absolute frequencies) were used for the description of the questionnaire.

Of the staff members 82.3% answered that the issue of sun protection was discussed daily or at least weekly with all

**Table 1** Questionnaire of staff members after intervention (n = 17)

Content of question	Relative (absolute) frequency, %
Sun protection is a subject more discussed after intervention	94.1 (16)
More children are regularly protected by sunscreen than before	58.8 (10)
Children are asked more regularly to play in the shade than before	58.8 (10)
A child with inappropriate clothes is given appropriate clothes	35.2 (6)
More children wear hats than before	82.3 (14)
The children learned about sun protection through the posters and the finger puppet of the mascot	82.3 (14)
Sun protection was subject during kindergarten teacher training	88.2 (15)

**Table 2** Questionnaire of parents after intervention (n = 36)

Content of question	Relative (absolute) frequency, %
Sun protection measures of the day-care centre have improved compared with the previous year	97.2 (35)
After intervention more regularly discussions with staff members about children's sun protection take place	41.6 (15)
More children wear hats after intervention	88.8 (32)
Staff members ask more regularly if the child has used sunscreen in the morning after intervention	44.4 (16)
There is more shaded area on the playground after intervention	88.8 (32)
There is more public information material available after intervention	83.3 (30)
The lecture of the parents brochure has improved sun protection of the own child	69.4 (25)
by avoiding direct sun more frequently	41.4 (15)
by using sunscreen more often	58.3 (21)
by putting the child a hat on more often	44.4 (16)
by putting the child a long sleeved shirt on more often	33.3 (12)

colleagues during intervention. 58.8% are informed about the actual UV-Index on a daily base. 94.1% of the staff members could name the four most important practices for sun protection (keep out of the sun, put on a hat and a shirt, use sunscreen). 76.4% of the staff members asked the parents during summer time daily or at least every second day if their children had used sunscreen on or not and 58.8% claim that the children are protected by sunscreen more regularly. 64.7% of the staff members reported that the training session has not made themselves wear a hat or a long sleeved shirt on sunny days on a regular base. 76.4% of the staff members read the

sun protection policy and knew at least four of the nine listed items.

Of the parents, 97.2% had the feeling that the sun protection practices of the child day-care centre have improved compared with the previous year and 94.4% of them were satisfied with the current sun protection practices. 66.6% of the parents could name the four most important sun protection practices (keep out of the sun, put on a hat and a shirt, use sunscreen). 66.6% of the parents read the information leaflet provided, after reading 44.4% put their child a hat on more often and 58.3% use sunscreen more often. 41.6% read the sun protection policy published on the blackboard. Only 13.8% remembered any of the policy's items. 72.2% of the parents completed medical education.

### Observation protocol

Changes in the sun protection practices of the child day-care centre were assessed by observation. Descriptive statistics (relative and absolute frequencies) were used for the description of the study population to assess differences in sun protection habits before and after intervention. The number of children wearing a hat increased from 13.2% to 73% after intervention. The percentage of shaded area also increased: before intervention approximately 70–80% of the playing ground was shaded on most days during period of observation (trees and one extendable sun panel which was extended on three of five observational days), after intervention approximately 90% of the area was shaded on most days during period of observation (trees, one extendable panel that was extended on 3 of 5 days and a second solar panel that was provided within intervention and that was always extended during observation).

In contrast, the clothing habit of the children (excluding head wear) showed no alteration after our intervention. The clothing habit of staff members also did not change through our intervention: hat use and appropriate clothes were not common, neither before nor after intervention.

In the day-care centre more information for parents about sun protection was available. A public blackboard announced the sun protection policy, the daily UV-Index and the most important sun protection practices. On each floor posters with cartoons of the mascot's adventures were put up and a finger puppet of the mascot was used for the sun education of the children (both provided through intervention).

### Discussion

The present intervention was designed to fit into a German child day-care centre with many other health priorities. The findings of the study suggest that a relatively brief intervention in a child day-care centre leads to a better sun protection of the children. Important elements were the introduction of a sun protection policy, training sessions for staff members and parents and the subsequent certification of the centre. The written sun protection policy was read rather by staff members than by parents and most staff members could

reproduce at least four of nine items of the policy. More children wore a hat when playing outside and there was more reported sunscreen use (Tables 1 and 2). The percentage of shaded area in the playing ground increased and staff members reported on asking the children more frequently to play in the shade, a fact not verified during observation. Neither the protective clothing practices of the children changed (excluding hat use), nor the time they spend outside during the most intense UV. The unchanged clothing practices could be due to the fact that the children's clothing had been appropriate before intervention. Protective clothing practices and hat wearing of staff members did not change after intervention. The finger puppet of the mascot 'Paul' and its comic adventures improved the children's knowledge about sun related issues as reported by staff members.

Only a few studies have surveyed sun protection policies and their effect on sun protection practices at child-day care centers. One recent study, which carried out a telephone survey on 327 day-care centers in Massachusetts, showed, that child day-care centers with a written sun protection policy are most likely to have sun-protection practices that are consistent with recommendations.<sup>19</sup> Sun protection policies were found to be positively associated with sunscreen and hat use, as seen in our study, and inversely associated with time spent outside, an observation that could not be made in our study. In agreement, an Australian intervention study, the Kidskin primary school project, found, that the implementation of a 'No hat no play' policy improved hat wearing of children in the high interventional group.<sup>20</sup> Schools in this group did not only receive a mail with sun protection policy guidelines but were also in telephone contact with the study group. The policy had only little impact on sun exposure during lunch time, a finding that agrees with the findings of our study. Another study carried out a written survey on sun protection practices and policies in 200 licensed day-care centers in Colorado,<sup>21</sup> of which only 56% were classified to have an adequate policy (criteria not defined). It was found that only 17% of the centers encouraged children to bring and use hats and long-sleeved shirts. 91% stated that staff members apply sunscreen to children, but only 54% reported sunscreen is applied 'often'. Those findings suggest that having a sun protection policy is no guarantee for appropriate sun protection practices, as also found in an Australian study which carried out a telephone survey with 177 child day-care centers in New South Wales. The study concluded, that having a sun protection policy does not necessarily translate into practice.<sup>22</sup> For example, 87% of the centers had a policy including the component 'wear broad-brimmed or legionnaire-style hats', but only 36% of the centers practiced hat wearing at all times.

These findings suggest that a written sun protection policy is an important part of sun protection in child day-care centers, but is not sufficient on its own. It has to be constantly supported and reinforced by centers' directors and staff members. To maintain the motivation of director and staff, a close personal contact between the certification committee and the

centre's director as 'opinion leader' is needed. Impersonal mail-only strategies were found to be ineffective in increasing implementation of sun protection policies.<sup>20</sup>

In Germany, to our knowledge, there exist not many child-day care centers with a written sun protection policy and there is a need for action to provide more child day-care centers with one.

The present study shows, that a relatively brief training session for staff members and parents given by experts leads to a significant improvement of knowledge in sun related issues (Figs 2 and 3). The effect lasted longer for staff members than for parents, 94.1% of the staff members and 66.6% of the parents could name the four most important sun protection practices in a questionnaire 12 weeks and more after the training session. A few other studies focus on short training sessions for staff members of child day-care centers. A case-control interventional study showed a significant improvement in sun protection knowledge of centers' directors who received a 3-h workshop about sun-related issues.<sup>23</sup> Further, directors who participated on the workshop were much more likely to apply sunscreen to the children over the whole year.

Generally, the case-control study showed that the change in sunscreen use was greater than in clothing and shade practices. This is in agreement with our study and the study from Massachusetts that showed, that most centers rely on sunscreen as primary sun protection practice (77% followed recommended sunscreen practices), but only 1.5% use protective clothing practice<sup>19</sup> It seems therefore important to use training sessions to strengthen the fact, that sunscreen should not be the only used sun protection practices but that a combination of all known practices is the best protection.

Another aspect to mention in training sessions should be the sun protection behaviour of staff members. In agreement to our findings it was found, that staff members in New South Wales tend to see sun protection practices primarily directed at children.<sup>22</sup> As children learn their behaviours and attitudes in the sun from parents and care givers,<sup>22</sup> this problem needs to be verbalized and further interventions should focus on staff and parents modelling protection behaviours in the sun. To maintain staff support and commitment the training sessions should be repeated as a booster on a yearly base. This is suggested by a multiyear study, the 'Sun Protection is fun' intervention in Houston, that carried out repeated training sessions for staff members of preschools over a period of 2 years.<sup>24</sup> It could be shown that the positive effect on sun protection practices was more pronounced after 2 years, which suggests, that continuous exposure to sun-related issues and periodic booster training of staff members may improve the sun protection in day-care centers further. An additional improvement in clothing practices and in the percentage of shade has also been seen. This shows, that multi-year studies are also able to improve sun protection practices that are generally more difficult to influence.

In our present study 66.6% of the parents read the information leaflet and 58.3% of the parents reported a change in the

sun protection behaviour towards their children after reading. 58.3% of the parents use sunscreen more often (Table 2). In contrast to our findings a recent case-control study that sent information packets to parents including a brochure on sun protection and a free sample of sunscreen did not find an impact on sun protection practices of parents. Nevertheless parents of the intervention group were more likely to be satisfied with the sun protection practices of their day-care centre.<sup>23</sup> These findings support our findings, in which parents reported that the sun protection of their children in the day-care centre has improved and that they do not want any changes in sun protection practices of their day-care centers.

A finger puppet of 'Paul', the turtle, and posters with comics of his adventures in the sun were given to staff members for educational reasons. Although the actual gain in knowledge of the children was not assessed in our study, 82.3% of staff members reported, that the children's knowledge concerning sun-related issues increased. This is in agreement with a study that developed a sun safety curriculum for preschoolers and found a significant gain in knowledge and comprehension in the posttests 2 and 7 weeks after the curriculum.<sup>25</sup> Within the intervention two comic characters were used to convey sun safety messages throughout the curriculum.

To our knowledge, this child day-care centre was the first one in Germany receiving a certification for improved sun protection practices. The certification seems to be an important motivating factor especially for staff members to support sun protection practices throughout intervention. As a mark of quality we expect that more day-care centers will show an interest in obtaining certification. The economical situation of the centers could be a barrier of adequate sun protection, since a recent study showed that centers with a low social economic level had less daily use of sunscreen and less hat use.<sup>19</sup> It has to be considered that the process of certification will lead to additional costs. Therefore, partners such as health insurances are needed to support the certification process for a better sun protection of more children in day-care centers.

In conclusion, a short-time interventional study with the introduction of a sun protection policy and educational elements for staff members, parents and children seems to improve sun protection practices in the child day-care centre while being economical and easy to replicate. Because of a high staff turnover an annual repetition of the training session as booster is essential to sustain staff support and involvement. The final certification of the day-care centre seems to act as a motivating factor and maintains the support especially of staff members. Since 88.2% of staff members claimed that sun protection was not part of their pedagogical education it seems important to integrate this topic into the health schedule of the German care giver education.

Some limitations of this study have to be considered. The data provided in the questionnaire by staff members and parents and the reports about sunscreen use might have been influenced by social desirability covering the effect of the

intervention. This information bias was uncontrolled in the present study. 72.2% of the parents who answered the questionnaire completed medical education, a fact that could have led to a higher susceptibility to improve sun protection of the children. Regarding the social economic level, the effect of the study may be less strong in day-care centers with a different social background and a lower social economic level.

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