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The psychological health of children working in brick kilns: A Classification Tree Analysis

Catherine Pellenq, Susan Gunn, Laurent Lima

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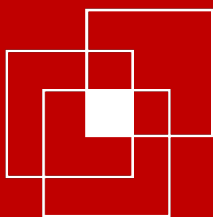
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The psychological health of children working in brick kilns

A Classification Tree Analysis



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Table of contents

- 1. Introduction 1
- 2. Methodology..... 3
 - 2.1 Example: Analysis of the first node 5
- 3. Discussion 7
- 4. Conclusions..... 11
- References..... 13
- Annexes..... 15
 - Annex I: Instrument for the psychosocial assessment of children at work (IPAW)..... 15
 - Annex II: Analysis of the succeeding nodes 17

Figures

- Figure 1. Percentage of children working and non-working in brick factories..... 4
- Figure 2. Psychosocial profiles of children 7
- Figure 3. Proportion of non-worker and worker children 8

1. Introduction

Many children are still engaged in hazardous work despite national laws and international Conventions. Such work is likely to damage their physical health, but does it also have an effect on their psychological health, development or social integration? If so, how do working children perceive their current lives and future? Does work help them develop certain coping skills, or does it undermine them? Is the psychosocial profile of working children different in any way from that of their non-working peers? Are working girls and boys affected differently by work?

Previous studies relating to working children's mental health have been largely clinical observations (Boidin, 1995) or country-based studies (Fekadu et al, 2006; ILO-IPEC, 2014c; Loughry et al, 2005; Alem et al, 2006), a noteworthy exception being a recent multi-country study of child domestic workers (Gamlin et al, 2013). While these are most valuable, what has been lacking is cross-cultural statistical data which would enable us to have a firmer grasp on the scope and nature of the effects of work on children's psychosocial health.

This paper analyses the results of the psychosocial component of a larger research project on the health of working children which was undertaken by the ILO. This four-country study, carried out in Afghanistan, Bangladesh, Nepal and Pakistan, sought to examine the degree to which health, and especially mental health, might be a critical variable to be considered in policy and action to address child labour (ILO-IPEC, 2011a, 2013, 2014a, 2014b, 2014c and 2014d; ILO-UNICEF, 2015). The study used a cross-sectional design and collected both quantitative and qualitative data on physical and mental health and the work/home environment.

The study population consists of 1,555 children, age 11 to 17, of which 1099 are boys and 456 are girls. Respondents were randomly selected from a purposive sample of brick kilns (designed to capture kilns of different types and different ecological zones) in the four countries. They consist of two groups: a) working children, who have worked at least two years in the brick kilns (915 respondents) and b) a comparison group of children from nearby villages who have never worked in the kilns (640 respondents).

2. Methodology

Investigating child workers' health presents a number of challenges because the methods must be applicable to low-resource situations where child labour is prevalent but where medical, psychological or research professionals are not present. An assessment tool was specially developed to measure children's psychosocial health in an occupational setting, called the "Instrument for Psychosocial Assessment of Working Children" (IPAW). This instrument was based on the theoretical work of Woodhead (2004) with contributions from others (Camfield et al., 2009¹; ILO-IPEC, 2013c; Jordans et al, 2011; ILO-IPEC, 2011) and underwent an extensive period of testing and validation prior to its use in the study.

The working children were administered the full 48-item IPAW questionnaire and the comparison group were given a 31 item version (work-related questions omitted)²; both used a Likert scale of 4 degrees (never, sometimes, often, always). The objective was to identify areas of psychosocial functioning in which the children who are working in the brick kilns differ from their peers who are not working in the kilns.

Classification Tree Analysis (CTA) was chosen as the strategy for analysing the data, using the R statistical software. This exploratory technique is particularly useful for complex data where there are missing responses or confounding variables which is often the case in research being undertaken in challenging conditions and environments. With this model, it is possible to distinguish the psychosocial characteristics of working children from those of non-working children on the basis of their responses to a set of questions. The CTA generates a multi-level diagram in the shape of a tree, with "branches" being the relationships and the "leaves" being mutually exclusive subgroups of individuals.

This presentation of the data on the child brick workers statistically demonstrates which items among many are most important in showing differences between working and control children. The CTA identified a set of eight questions in the IPAW which are particularly explanatory (Morgan, 2014). These relate to social acceptance, sense of security, optimism, social support, play and leisure, alienation, and anxiety. The precise items are:

- Do you feel accepted by the other families around here?
- In your day-to-day life do you feel safe?
- Do you think your life will get better some day?
- Do you generally feel pretty confident?
- Do you have one or more good friends that support you?

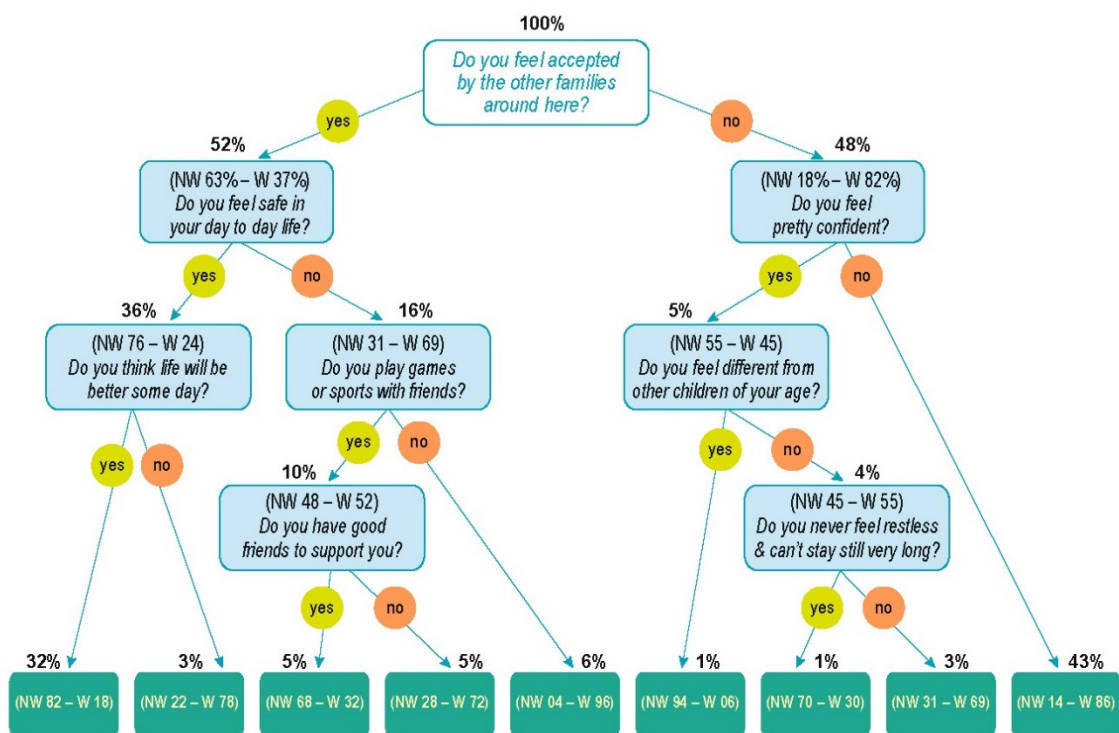
¹ See also University of Oxford, *Young lives longitudinal study into children and youth around the world*, available at <https://www.younglives.org.uk/>.

² Questionnaire used provided in Annex I.

- Do you play games or sports with friends?
- Do you feel very different from other children your age?
- Do you feel restless and cannot stay still very long?

By knowing the responses of a child on these eight items, we can predict whether or not s/he is a brick kiln worker with a minimum risk of error. Put another way, on the basis of the children’s responses on these eight questions nested from top to bottom, each level offering a further refinement of the previous one, the Classification Tree Analysis identifies the psychosocial characteristics on which children who are working in brick factories differ from those who are not (Figure 1).

Figure 1. Percentage of children working and non-working in brick factories



NW = non-working children
W = working children

The top or the “root” of the tree is the total sample of 1.555 children, composed of 41 per cent non-working and 59 per cent working children. At the bottom of the figure are the “leaves”, i.e. the characteristics which differentiate working children from non-working children. In between, are 7 “nodes,” or points of comparison.

2.1 Example: Analysis of the first node

At the root (which explains 31 per cent of the variance between workers and controls), there are two groups of children on the item “Do you feel accepted by the other families around here?” The split between the two groups is roughly on a score of 2.5, which is in the exact middle of the Likert scale graduated from 1 (never) to 4 (always). Of these, 52 per cent of the sample have scores superior or equal to 2.5 on this question, which means that the majority of the children feel “often” or “always” accepted by families around them. In this group of children, those who work are significantly less numerous than those who do not work (37 per cent vs. 63 per cent). Since 48 per cent have lower scores (scores not superior or equal to 2.5) and report feeling “never” or only “sometimes” accepted by families around them, they experience a sense of rejection. Here, the workers represent 82 per cent of the group, the non-workers represent only 18 per cent. The proportion of workers is low in the more positive group in terms of wellbeing (feeling accepted) and it is very high in the more negative one (feeling rejected). Looking at it from a predictive point of view, the classification tree indicates at this stage that if a child does not feel accepted by other families around him or her, it is likely that s/he is working. At this stage, the error rate of such a classification is high, about -10.6 percent, which means that 134 non-working children could be wrongly classified as ‘working’ and 299 working children could be wrongly classified as ‘not working’.

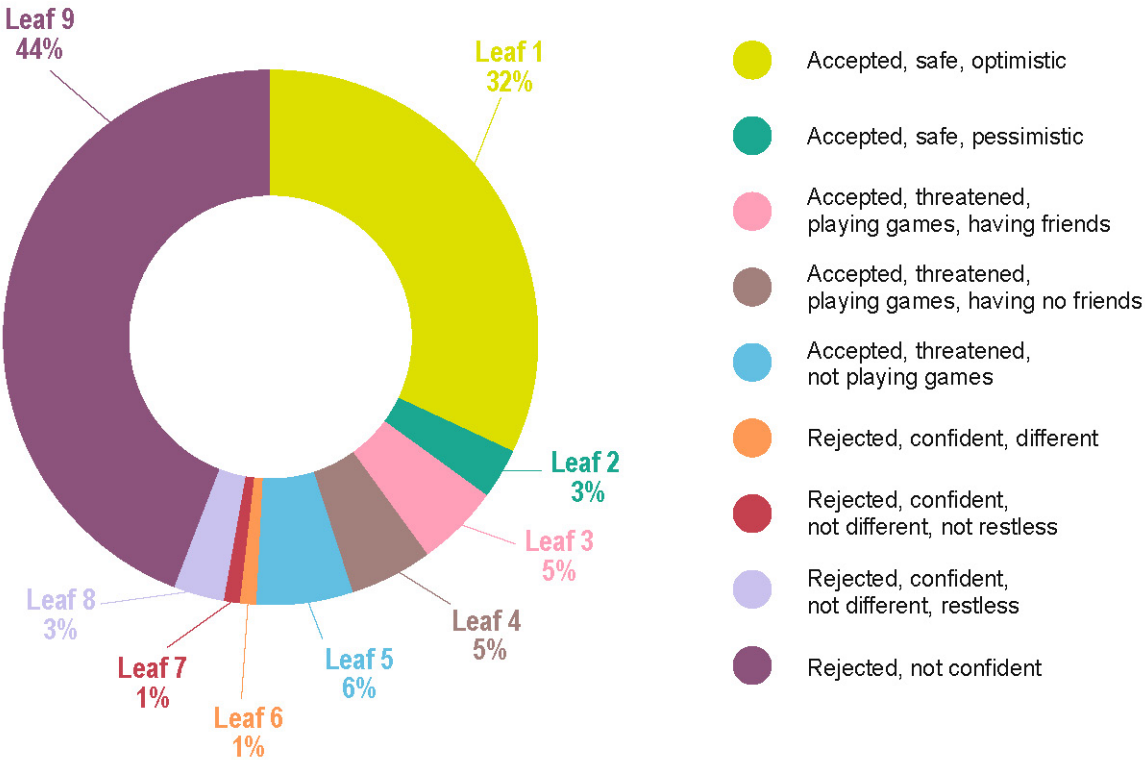
Such an analysis is carried out at each of the succeeding nodes of the classification tree. At each of these points, the psychosocial characteristics of the groups are increasingly refined and the likelihood of error is reduced.³

³ The analysis at each of the succeeding nodes is described in Annex II.

3. Discussion

The Classification Tree Analysis (CTA) developed for this study is fairly parsimonious with four levels of segmentation resulting in nine “leaves” or discrete groups and it appears to be highly effective in predicting if a child is working or not in a brick kiln. The analysis which is carried out at each node of the classification tree shows, at each stage, a closer relationship between work status and the psychosocial status of the child. At the end of the process, the results indicate that by knowing these eight elements of a child’s psychosocial wellbeing, we can predict whether the child is working or not working in the kilns with an acceptable error rate of about 1.5 percent. The nine leaves correspond to nine psychosocial profiles of children (Figure 2).

Figure 2. Psychosocial profiles of children



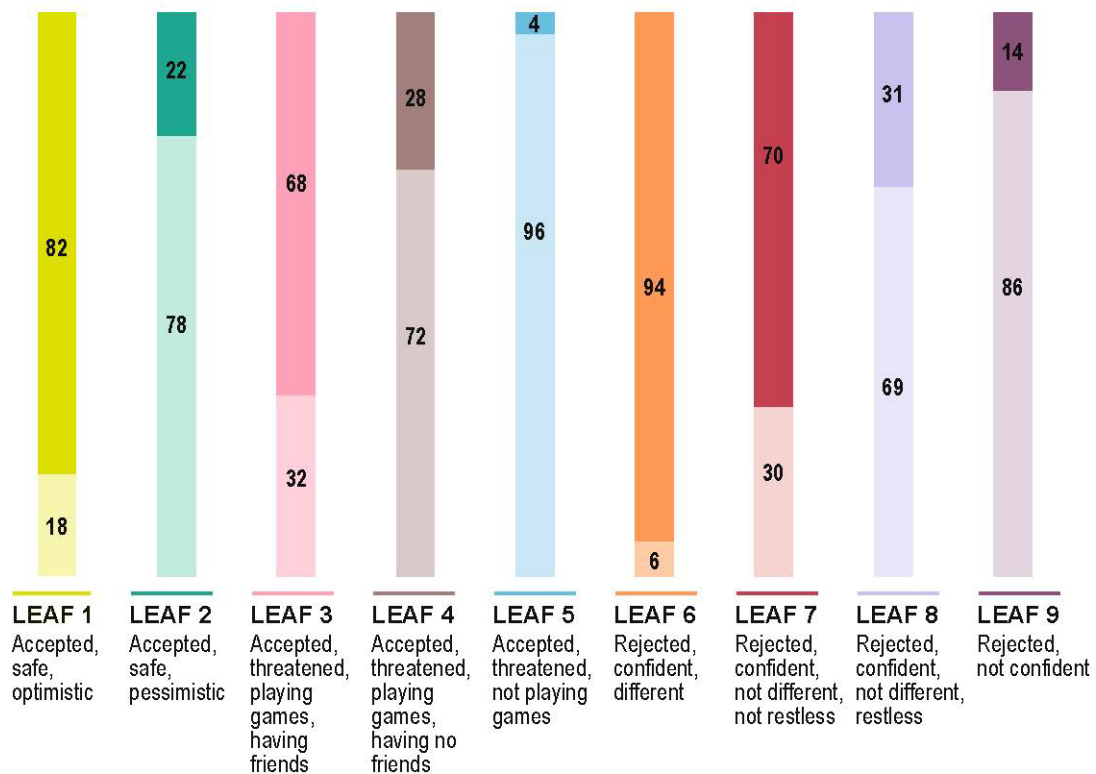
The largest category (43 per cent of the entire sample) is composed of children who do not feel accepted by the surrounding families and do not feel confident. These feelings are not consistent with a strong sense of well-being. In this group, 86 per cent are children who work in the brick factories.

The second largest category, representing 32 per cent of the entire sample, is composed of children who feel socially accepted, safe and optimistic. Among them, only 18 per cent are working children.

The six other categories of children are much smaller (they represent 1 to 6 per cent of the entire sample). There, the working children represent the major part of the children who do not feel accepted by others (i.e. feel rejected), do not feel safe (i.e. feel threatened), do not feel confident, are tired and have little hope for the future. Some among them do not play games or sports and feel very isolated (not having friends to support them).

Overall, kiln workers are under-represented among the 1st, 3rd, 6th and 7th leaves (1st and 3rd are the more positive profiles in terms of wellbeing) and they are over-represented on the 2nd, 4th, 5th, 8th and 9th leaves (4th, 5th and 9th are the more negative profiles in terms of wellbeing) (Figure 3).

Figure 3. Proportion of non-worker and worker children



Darker part of bars = Proportion of non-workers
Lighter part of bars = Proportion of workers

With this classification tree analysis, we can predict with a minimal risk of error that if children do not feel accepted by other families around them and do not feel self-confident (Leaf 9) then they are working in the brick kilns. It is also likely they are working if they are feeling confident and no different from others, but at the same time agitated or uneasy (Leaf 8). If they feel accepted but not safe and never play sports or games with friends

(Leaf 5) or when they have leisure and play but have no friends to support them (Leaf 4), it is also likely that they are working. If they feel accepted and safe in their daily life, when they think that their life will never get better (Leaf 2), it is also likely that they are working. On the contrary, if a child feels accepted by other families, feels safe in her or his day to day life, and thinks that life will get better someday (Leaf 1), we can predict that s/he is not working in the kilns.

The relationships between the items identified by the CTA do not change with the gender of the child: girls share the same overall psychosocial characteristics as the boys.

These results indicate that children working in the brick kilns have a significantly higher risk of psychosocial distress than their non-working peers. Eight fields of psychosocial wellbeing are what account for the difference. These are: the degree to which they feel accepted by others, have a sense of confidence and safety in daily life, look forward to a better life, have friendships, engage in leisure activities (games and sports), feel calm or restless, and have a sense of belonging. It should be noted that the results obtained from the classification tree analysis do not indicate the direction of causality or whether there might be other influential factors, e.g.: is it work in brick kilns that negatively affects the psychosocial wellbeing of the children or do the children come to their work in the kilns with already a different set of psychological characteristics? Further research, especially longitudinal studies, could help to clarify this.

This analysis is important for future surveys on psychological risks to adolescent workers in that it reduces the possible variables to those which are crucial to include, i.e. the eight psychosocial questions noted above. In fact, it is the first three or four items (questions 39, 48, 19 and 34) which are especially crucial in that they explain respectively 49 to 51 per cent of the variance between workers and non-workers. Inclusion of these items in a survey or study is sufficient to give an indication of psychosocial impairment.

4. Conclusions

The Classification Tree Analysis (CTA) presented here, using the example of children working in brick kilns, demonstrates that there is a strong relationship between work and children's psychos are significantly disadvantaged compared to non-working children from the same environment. The results of the analysis present the first statistically-based justification for giving high priority to the children working in brick kilns on the basis of the psychosocial risks alone. The psychosocial data is particularly important as it shows that these children need assistance in many different ways, not just simply being removed from work. Providing them with education is probably the most effective response, but this needs to be accompanied by other forms of psychosocial support such as opportunities for socializing and play.

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DOI: [10.1163/1571818043603607](https://doi.org/10.1163/1571818043603607).

Annexes

Annex I: Instrument for the psychosocial assessment of children at work (IPAW)

(Version 2014)



Domains	Questions	1	2	3	4
Part A: For working children only					
Self-esteem	1. Are you proud of your work?				
	2. Do you feel like you have the skills needed to do your job well?				
	3. Do you think others appreciate the work you do?				
	4. Do some people look down on your work or on you because of your work?				
	5. Do you feel that your family relies on you and needs your help				
Stress	6. Do you feel under pressure to work faster and harder?				
	7. Do you feel bored because there is not enough to do?				
	8. Does your family, employer or others ask too much of you?				
	9. Do you get bored at work doing the same thing for many hours in a row?				
Personal agency	10. Do you feel tired because of the long working hours or heavy work load?				
	11. Do you feel like your work is prevents you from doing things you like to do?				
Relationships	12. Do you feel that if you wanted to you could choose what to do & not to do?				
	13. Does the environment in which you are working bother you at all?				
Supervision	14. Are you comfortable with the people you work with?				
	15. Do you feel that people watch over you to make sure you don't get hurt?				
	16. Do people at work teach you what to do and how to do it?				
Part B: For both working children & comparison group					
Leisure	17. Do you have free time each day to do just what you want?				
Emotions	18. Do you have lots of energy?				
	19. Do you generally feel pretty confident?				
	20. Do you have any difficulty sleeping?				
	21. Do you have trouble concentrating?				
	22. Do you feel restless and cannot stay still very long?				
	23. Do you feel sad and like crying?				
	24. Do you get into fights or quarrels easily?				
	25. Do you feel lonely?				
	26. Do you get very angry and often lose your temper?				
	27. Do you have little appetite or interest in food?				

Domains	Questions	1	2	3	4
	28. Do you find that you forget things?				
Somatic	29. Do you feel tension in your body?				
	30. Do you feel dizzy?				
Anxiety & Chronic fear	31. Do you feel afraid or nervous?				
	32. Do you worry and think a lot?				
	33. Do you think back about all the bad things that have happened to you?				
Hope & Helplessness	34. Do you think your life will get better some day?				
	35. Do you think your life is worse than that of other children?				
	36. Do you think life isn't worth living?				
Social factors	37. Do you feel supported and loved by your family?				
	38. Is there conflict in your family?				
	39. Do you feel accepted by the other families around here?				
	40. Do you have one or more good friends that support you?				
	41. Do you people reject or tease you or call you names?				
	42. Do you play games or sports with friends?				
	43. Do you feel very different from other children your age?				
Abuse & Mistreatment	44. Do you get scolded, or criticized or made to feel small or stupid?				
	45. Do you get beaten at home or at work?				
	46. Has anyone at work tried to touch you in a bad way?				
	47. Have you been severely punished for mistakes made?				
	48. In your day-to-day life do you feel safe?				

Annex II: Analysis of the succeeding nodes

At the first node, among the first group of children (the 52 per cent who feel accepted by the other families around them) there is a segmentation on the item "In your day-to-day life do you feel safe?" On this node, 36 per cent have scores superior or equal to 2.5 on this question. That means that most of the children feel safe. But 16 per cent have lower scores, indicating that they live under a sense of threat; they say that they "never" or only "sometimes" feel safe. In the group composed of the children who feel 'accepted and safe', those who work are significantly less numerous than those who do not work (24 per cent vs. 76 per cent). Conversely, in the second group composed of children who feel 'accepted but not safe', the workers are over-represented with 69 per cent, the non-workers represent only 31 per cent. Once again, the proportion of workers is low in the more positive group (feeling accepted and safe) and it is high in the more negative one (feeling accepted but under threat). So if a child feels unsafe, one can predict that s/he is working.

At the second node, within the second group of children (the 48 per cent of those who feel less accepted by the families around them), there is bifurcation on the item "Do you generally feel pretty confident?" The difference between the groups shows a threshold on scores greater than 3.5 which is the highest score on the four levels of the Likert scale, corresponding to the answer "always". Very few children (5 per cent) feel confident when they sense they are not accepted by other families. Of the 5 per cent of children who "always" feel confident, those who work are less numerous than those who do not work (45 per cent vs 55 per cent). It is likely that this group of children is composed of minorities (migrants, ethnic or religious minorities), who feel rejected because of their status but at the same time confident because they are part of a social group. On the other hand, those who fall into the category of 'Not accepted (rejected) and not confident' which is composed of the 43 per cent of children who do not feel always confident, the workers represent 86 per cent of this group, the non-workers representing only 14 per cent. This final "leaf" represents the biggest group of the population and the proportion of workers in it is more than 6 times those of the non-workers.

Once again, the workers are under-represented in the more positive group (feeling confident) and over-represented in the more negative one (feeling unconfident). Looking at it from a predictive point of view, if a child feels unconfident as well as unaccepted by surrounding families, it is likely that s/he is working.

The second level of inquiry on this node "feeling safe in day-to-day life" among children feeling accepted by surrounding families and "feeling pretty confident" among children who do not feel accepted helps narrow the error rate of the classification and tightens the prediction of the work status of the child. At this stage, 49 per cent of the variance between workers and controls is explained.

At the third node, which explains 2 per cent more of the variance, the children divide into two groups on the item "Do you think your life will get better some day? There is a

threshold on scores superior to 1,5. A large group of children (32 per cent) express a certain type of wellbeing, i.e. feeling 'accepted, safe, and optimistic.' The non-workers represent a large majority (82 per cent) while workers are only 18 per cent. The group of children who are feeling 'accepted, safe, but pessimistic' is composed of socially integrated children, who feel safe but who see no possibility of improving their situation and hence are pessimistic. Here, most (78 per cent) are workers.

There is a fourth node for children feeling 'accepted yet under threat', on the item "Do you play games or sports with friends?" There is a threshold on scores superior to 1,5 which means that when children answer no, they have no opportunity for play or leisure. One group of children plays sports and games with friends, one group never does. In it, 96 per cent are working children.

There is a fifth node for children who feel 'rejected yet confident' on the item "Do you feel very different from other children your age?" These are mostly non-workers (94 per cent). Of those who feel 'rejected, yet confident and not different from others', most are working children (55 per cent). One hypothesis might be that they feel rejected because, unlike the non-working children, they are engaged in work of low status, but yet feel confident because of the sense of belonging, camaraderie and similarity they have among their peers at work.

There is a sixth node on children feeling 'accepted and who play games and sports with friends, but feel under threat' on item "Do you have one or more friends that support you?" This group includes only 32 per cent of workers while those not having friends' support accounts for 72 per cent.

The seventh node is for the children who feel 'rejected but confident and not different from others' and refers to the item "Do you feel restless and cannot stay still very long?" On this node there is a threshold on scores smaller than 1.5 which corresponds to the answer "never restless". Of those who are 'rejected but confident, not different, and never tired', a majority (70 per cent of 1 per cent) are non-working. Those who feel fatigue (3 per cent of the entire sample) are largely working children (69 per cent).

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