Monograph Matters

SRCD Society for Research in Child Development

Handbook for Conducting Longitudinal Studies: How We Designed and Conducted the Cardiff Child Development Study

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Recommended use:

This handbook offers resources to investigators for conducting longitudinal studies.

Recommended readings:

Hay, D. F., Paine, A. L., Perra, O., Cook, K. V., Hashmi, S., Robinson, C., Kairis, V., & Slade, R. (2021). Prosocial and aggressive behavior: A longitudinal study. *Monographs of the Society for Research in Child Development, 86*(2). https://doi.org/10.1111/mono.12427

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INTRODUCTION

The history of developmental psychology features many important longitudinal studies of children's behavioral, cognitive, and social development. Some studies use large, population-based samples. Others trace the development of a small group of children over time. Whatever the size or the topic, any longitudinal study of children's development requires great commitment on the part of both the researchers and participants. In our experience, many research methods courses in psychology focus more on experimental design and measurement issues, but not the practicalities of conducing longitudinal research. We have reflected on our own experience conducting a relatively short-term study of social development in a medium-sized community sample. We hope that this brief handbook might be useful to new investigators and postgraduate students who hope to conduct longitudinal research.

Steps to Take When Carrying Out a Longitudinal Study

Step 1. Decide on Your Research Questions

Longitudinal research has always been an important strand of developmental psychology. Much important longitudinal research features long-term studies of many different aspects of development in well-defined populations (e.g., studies of large birth cohorts in Norway, Finland, Sweden, New Zealand, the UK). Other longitudinal studies are focused on particular study questions in community or high-risk samples.

We sought to conduct a longitudinal study of early social development in a sample that was small enough to observe children directly but large enough to have statistical power.

Step 2. Seek Appropriate Funding

Around the year 2000, the UK Medical Research Council had set a research priority: the study of antisocial personality disorder and childhood conduct disorder. We submitted a proposal that had three main aims:

1. To chart the normative development of aggression from infancy to early childhood;
2. To identify prenatal and postnatal risk factors that influence individual differences in early aggression; and
3. To identify patterns of underlying problems in children who showed aggressive behaviour.

However, it is not sufficient to study aggression on its own. We also sought evidence for prosocial behaviour as a protective factor that might prevent serious behavioural problems.

Step 3. Define and Justify the Population from which You Will Sample

Our own community provided a nationally representative sample. In 2000, Cardiff, UK, the capital of Wales, had a population of about 300,000 residents with sociodemographic characteristics that were very close to the UK population as a whole.

Step 4. Recruit the Sample

(1) Do power calculations to estimate the right sample size.
(2) Gain ethical permission.
(3) Get advice on data protection.
(4) Get permissions to recruit in your catchment areas.
(5) Get advice from gatekeepers on the best way to approach potential participants.
(6) Prepare information sheets and ethical permission forms.
(7) Explain your design and procedures clearly; consider literacy issues and any needs for translation.

Step 5. Retain Your Sample Over Time

It is important to retain as many participants as possible over the course of a longitudinal study, or the study loses validity. However, participants **always** retain the right to withdraw from the study; respect their wishes and thank them for their participation. Some are happy to continue in the study, but may have difficulties (e.g., they have moved away, sometimes around the globe, and may only be able to send in questionnaires). Some may not be able to participate at one point but are willing to be contacted in the future; keep careful records of your correspondence, to make sure you respect their wishes.

Step 6. Keep Up with Your Longitudinal Assessments: More Resources May Be Needed

In the third year of our study, four waves of assessment were taking place at once, at different times of day:

- Some families were still being recruited and interviewed during pregnancy.
- Some infants were being observed at 6 months.
- Some families were participating in the 1 Year Laboratory Birthday Parties.
- A few children were being observed at the 1.5 Year Home Visit.
- New research assistants and postgraduate students had to be recruited and trained.
- Some protocols required additional resources (e.g., the 1-year and 2.5-year laboratory birthday parties required five researchers to be present at each party).

Step 7. Provide Appropriate Feedback to Participants

Be clear that this is a *scientific* study of children's development and you cannot provide individual clinical feedback that touches on parents' concerns. Instead, provide information about existing support services for such concerns.

At intervals, provide general feedback to all participants about findings emerging from the study. It is important to report findings to your participants, in an accessible way, without confusing scientific jargon. For example, we sent out newsletters at intervals. At the end of the first five waves of assessment, we made highlights DVDs for each family, which contained clips from each time point, and sent them along with a summary of our findings. *The following pages show the text of the newsletter we included with the highlight DVDs.*

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Thank You!

In the last few years, we have been privileged to get to know you all and watch your child grow from a tiny baby to a confident three-year-old. This DVD presents some highlights from your child's first three years. We've learned so much about early development from this study. Here are some of the things that we have learned:

The CCDS: The Families Who Participated

Over a two year period, we contacted families who lived in the areas covered by Cardiff and Gwent Health Care Trusts who were expecting their first baby. 332 of you agreed to participate in our study, and over 300 of you are still participating. It turns out that the CCDS provided a snapshot of first-time parents in the UK as a whole. When we first met you, 90% of you were in stable partnerships, though only 50% of you were married. In terms of your occupations, 51% of you worked in jobs that are categorised 'middle class.' On average, mothers were 28 years old (ranging from 16 to 43) and fathers were 31 (ranging from 15 to 57). 65% of you had been educated beyond GCSE. All of these statistics are very close to the figures for the UK as a whole. This means that we are studying child development in a very representative group of families.

All of you spoke frankly about your lives and the challenges of becoming parents. All of you were concerned about balancing work with your new roles as parents. Some of you experienced health problems during the pregnancy; for example about 1 in 4 of you experienced high levels of anxiety or depression while pregnant. This was often related to poor housing or lack of social support, or problems experienced in the past. Such issues affected fathers as well as mothers. However, all of you expressed hopes as well as fears, and were trying to rise to the challenge of this major change in your lives.

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The First Home Visit

We contacted you when your baby was approaching 6 months old. At that point, we were able to trace all but 8 of you, and 96% of you participated. We were interested in what babies pay attention to, what they might learn from other people, and how they react to everyday challenges, such as being placed in a car seat or meeting a new person. We also wanted to see them with the parent who looked after them during the day, playing games but also being fed. The home visit taught us a lot about babies in general at this age, but we also came to realise that every baby is a unique individual. Some of the babies objected strongly to being placed in the car seat. This related to what you, your partner, and other family member or friend told us about your baby's general inclination to get cross or hit or bite people. Different babies reacted to situations in their own unique ways. On the video, you will see your baby's reaction to a very friendly puppet; at this age, most of the babies found the puppet's attempts to tickle them rather funny, but some did not like it, and, as they grew older, most children began to find the puppet to be a bit over-friendly. This helped us to understand how most children gradually learn to defend their possessions and have a sense of personal space.

On the video we have also shown you how your baby already could work with you to learn how to use a new toy. This showed us that how parents speak to their babies at this age is very important. How much you talked to the baby at this age was related to your baby's own ability to communicate by pointing things out to other people at the time of the first birthday party.

The First Party

Although we couldn't trace everyone, and a number of you had moved away from Cardiff, most of you were able to come to the first birthday party. At this age, we were very interested in your infant's growing ability to understand the world and to be able to communicate with other people. On the video you will see your baby try to find a toy that has been hidden. At this age, many babies go back to the first place they found a hidden toy, even if they have just seen it hidden somewhere else! This shows how babies are just beginning to be able to hold two things in their mind at once. Babies who are learning more than one language are especially good at this. We also looked at the babies' ability to look where another person looks, to imitate what another person does, and to take turns at games.

Again, one of our main interests was to see how babies react to unusual events, and so we invited your babies to take part in a Teddy Bears picnic with a very special guest. As you know

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some of the babies found the Teddy Bear amusing, others were a bit upset, and some checked back with you to see how they should react! We also wanted to see how babies at this age might play with other babies they had never met before. Some psychologists believe that babies are naturally aggressive and only gradually learn to share with others, but that was not the case in the CCDS. At the first party, the infants were more likely to share toys with each other than they were to snatch toys or to push or pull at each other. Indeed, only a handful of the CCDS babies ever tried to hit another partygoer. Our findings tell us that babies are naturally sociable but not necessarily aggressive.

The Second Home Visit

We made another visit to your home when your child was around 1 ½ years old. Those of you who have moved away from the UK kindly completed questionnaires about your child's development. We are grateful to all the mothers, fathers, grandparents and other family members or friends who have completed questionnaires throughout the study. Mothers, fathers and other family members or friends tend to agree very well about each child's strengths and difficulties. What you told us on the questionnaires has allowed us to see your children's individual personalities develop over time. When possible, we were also very interested to see your child playing naturally with a familiar playmate. About three-quarters of you were able to find a friend with a child close to your child's age to take part in the play session, and so we would like to pass on our thanks to your friends as well.

The Second Party

When your child was between 2 ½ and 3 years old, we held another party. We played games with each child individually and then held another Teddy Bears Picnic. At this age we were especially interested in your child's growing ability to talk and think things through, especially when asked to be patient or careful or cope with the fact that things don't always work, or play games that might seem rather silly, such as pretending that a paper party hat is a trumpet. We found that children at this age were sometimes willing to go along with our silly ideas, especially if they found them funny, but might also tell us how to do things properly, like putting the right shape in the right hole in the shape-sorter. Once again, the children responded in their own unique ways to the Teddy Bears Picnic. Some were startled by the Teddy Bear and happy when Teddy went away. Others enjoyed Teddy's company and were sad when they had to say goodbye to Ted.

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What Was Happening on the Inside

Because infants cannot always tell us what they are feeling, we also measured their activity, their heart rate and the level of stress hormones they produced in their saliva. This is giving us a deeper understanding of the ways in which infants cope with everyday challenges. So far we have learned that different infants reacted in quite different ways to the challenge of the first home visit and the first birthday party.

In the Future

We have just begun our task of collating and analysing all the findings from the CCDS. We will be in touch again with further newsletters as new findings emerge. Once again, we are deeply grateful for your help and commitment to the study. It has been a privilege to get to know you and you children.

Step 8. When Analyzing your Findings, Retain the Integrity of your Longitudinal Dataset

When possible, impute missing data. You will have missing data, for different reasons:

- Some participants will not complete questionnaires.
- Some participants may be unable to participate in observational assessments or experimental tasks.
- Some participants may not be able to take part in a wave of data collection at all.
- Some may have decided to drop out of the study.

Missing data are very common, but they can threaten validity of the conclusions that you draw from your dataset. Researchers can tackle these threats by capitalizing on:

- The large amount of information collected in the longitudinal study, which allows researchers to investigate and test assumptions about the reasons for the missing data (e.g. is the likelihood of dropping out associated with socio-demographic characteristics?).
- Modern methods for handling missing data:
    - Multiple Imputation or direct fitting (e.g. Full Information Maximum Likelihood, or FIML) implemented in common statistical software.
    - These methods help estimate parameters taking into account the mechanisms underlying data missingness.

However, handling missing data requires reflection and insight into the assumptions concerning mechanisms underlying missingness. It's crucial to know and understand your longitudinal data.

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Step 9. Follow Up Your Sample Only if You Have Additional Research Questions that Need Answers

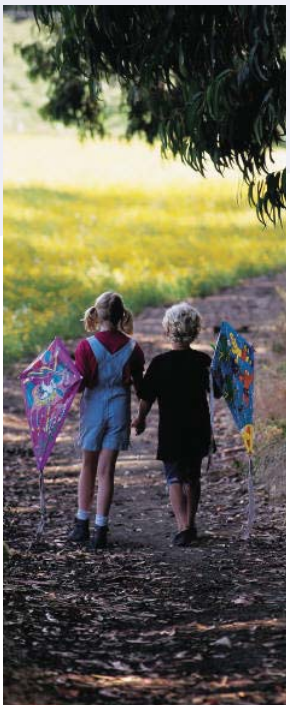
The large birth cohort studies have yielded development, aging, and outcomes for the next generation. Smaller samples may lack statistical power for long-term follow-ups. It might be better to design new studies to answer new questions.

In the case of the Cardiff Child Development Study (CCDS), the questions asked originally focused on infancy and early childhood. We conducted one final follow-up at age 7, to study children's aggressive behavior and prosocial skills at home and school. We asked whether some children had developed more severe behavioral problems.

We sent one more newsletter to the families in the sample to explain what we now wanted to study and report more of our findings (*see following pages*).

Newsletter 2013

Settling into the School Years: Follow-up of the Cardiff Child Development Study (CCDS)



It's been some time since we sent you the DVD with highlights of your child's first three years. Since we last saw you we have been busy looking at videos, listening to interviews, tabulating questionnaires and writing papers based on the findings from the CCDS. We feel very privileged to have such a unique insight into family life during the first decade of the new millennium! There has been a lot of interest in our study both nationally and internationally and because you have been so kind with your time our research findings are beginning to influence policy and practice.

Due to our success so far, we've been lucky enough to receive more funding from the Medical Research Council to meet with you all again, after the children have settled into primary school. It is because of your kindness in sharing little snapshots of your lives that we are able to keep the study going and make sure that we can capture family life in Wales. We are hoping to make contact with you over the coming months to ask if you would allow us to make another visit to your home, between the time your child is six and seven and a half years old. Meanwhile we'd like to tell you about some of our recent findings.

Sharing Is More Common than Aggression

Many people believe that human infants are naturally rather aggressive and have to be taught to share. Our study is one of the first to show that it's actually the opposite: sharing is more common than aggression. We studied the children's behaviour with other children they'd never met before in the birthday parties we held at the University. We've already told you that, when they were one-year-olds, the children were far more likely to share toys with the other partygoers than they were to tug on toys or try to strike out at the other children. This remained true when we held parties again when the children were between two-and-a-half and three years old. Most of them shared toys with the other children; about half tugged on toys; but very few ever tried to strike out at the other children. So we've shown that 'the terrible twos' are not so terrible after all!

Those children who were most likely to get frustrated or angry had cried more when they were babies. They had more difficult early lives and their mothers and fathers had often experienced

problems with anger or depression. Even so, their overall levels of hitting others and tugging on toys were quite low and our findings show that even children who struggle with their emotions can interact well with other children. As we analyse our findings we are beginning to find out how complex young children are.

Imagination and Coping at the Birthday Parties

At the birthday parties, the children met two costumed characters, a Birthday Lady with a picnic basket and a bear. At the toddler parties, we could see the children's imaginations at work. They pretended to eat the play food and offered cups of tea to their parents and the other children at the party. Some even offered play food to the bear! The children talked about what they were imagining and pretending to do. However, the ability to imagine things means that sometimes we worry about things happening that we would not want. This was true for some children at the parties. After the bear left, some children expressed their worries that he might return. Other children were sad that the bear had gone away.

Our study showed that infants and toddlers can cope with an afternoon of challenging experiences. However, some infants found the parties more stressful than others and this was noticeable in their behaviour and their biology. Our analyses of the stress hormones in their saliva showed that infants whose parents had experienced times in their lives when they had felt low in mood took a little longer to settle down during the visit to the University.

Talking to Babies Really Matters

When we visited you when your baby was only six months old, we asked you to show your baby an activity board. We believed that this was a snapshot of the way you would ordinarily relate to your baby and it was great to hear many of you tell your babies all about the pictures on the board. How parents talk to babies really matters. If parents talked a lot, if they treated their babies as people with a mind, and if they used the melodic tone of voice we call 'baby talk,' their infants were better able to communicate with the researchers they met at the University. They developed better vocabularies and planning skills and they were less likely to show signs of anger or frustrated behaviour as toddlers.

The Next Phase of our Study

We will be contacting you about the details for the follow-up after your child turns six years of age. If your child is older than that now, we hope to visit you at home again before he or she is 7 ½ years old. We will catch up on what's been happening in your family since we last saw you, ask you about how your child has settled into school, and invite your child (and any new brothers and sisters who have since arrived) to play more games, including a special computer game we have invented for the purposes of our study. By doing this follow-up study, we are hoping to build upon what we've already done and learn more about the factors that promote children's health and wellbeing. We would be delighted to see you again to hear your stories.

With very best wishes,

Dale Hay and the CCDS Team