Savant Syndrome: processes underlying extraordinary abilities

Robyn Young

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Department of Psychology
University of Adelaide
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Summary

Examples of individuals who demonstrate extraordinary abilities despite low general levels of functioning have been thought by some theorists to pose a dilemma for the construct of general intelligence. Such individuals, often referred to as “savants”, are the focus of this thesis. “Savant Syndrome” refers to observable behavioural characteristics rather than to a diagnostic classification and the term therefore incorporates all types of intellectual disability, including autism.

Abilities demonstrated by savants include: musical precocity, arithmetical and calendrical calculations, verbal representations, highly developed sensory discriminations, artistic ability, mechanical dexterity, mathematical skills, and memory for facts. The levels of these abilities demonstrated by savants vary considerably.

Those cases who demonstrate levels of ability beyond the accomplishments of most people in the general population are referred to as “prodigious” savants, whereas those whose skill is less highly developed although still beyond the range predicted by a generally low level of intelligence are described as “talented” savants (Treffert, 1989, pxxxv).

This thesis has six chapters. The first presents a detailed account of recent research in the field of savant syndrome, discussing existing terminology, incidence levels, types of disabilities associated with the syndrome, the representation of these abilities, the difficulties posed by such individuals for models of general intelligence and the extent to which these abilities reflect intelligent behaviour.

Chapter 2 presents a single-case study of a male autistic-savant with prodigious abilities in music. Specifically assessed was his ability to play two unfamiliar piano pieces after listening to a tape-recording. Other components of his musical ability assessed were pitch recognition, improvisation and ability to provide harmonic accompaniment. His musical precocity was examined in relation to his general level of intellectual functioning as indexed by a battery of standardised tests of intelligence, memory, reading, visual organisation and creativity. His parents and two male siblings also completed tests of intelligence. Results from psychometric testing indicated that this person has diverse and idiosyncratic levels of cognitive functioning, with
difficulties in verbal reasoning but high levels of concentration and memory. His speed of information processing, as indicated by inspection time, was better than average. He demonstrated perfect pitch recognition and other family members also demonstrated excellent relative pitch. His ability to recall immediately and perform music unfamiliar to him but structured within both the diatonic and whole-tone systems was exceptional. Analysis of errors suggested that his skill was dependent upon his familiarity with musical structure and was therefore organized and rule-driven. He demonstrated competence in improvisation and composition, by adhering to structural representations of familiar musical rules.

Chapter 3 focuses on calendrical calculation - the capability to state correctly the day of the week upon which any given date fell or will fall. Analyses of the response times to dates presented for nine subjects suggested that they were aware of rules and regularities associated with the calendar, including knowledge of the 14 different calendar templates, one of which describes any calendar year. In each case strategies were rigidly applied and could not be modified easily, even when to do so would have facilitated performance. Although speed of responses provided the primary measure for making inferences about the operations involved in the calculation of dates, number of errors and other behaviors associated with calendar features were also considered, as were reports from savants and care-givers relating to calendar performance. Results suggested that each subject had a long-standing, strong interest in calendars and had devoted considerable time and extensive practice to the study of calendars and dates. It is concluded that these savants were not reliant on mathematical algorithms but instead used knowledge-based strategies. Moreover, results indicated a limited range of dates for which each person could calculate days. Thus, results suggested that a well-developed, associative long-term memory is critical to the development of savant skills associated with calendrical calculations.

Chapter 4 presents cognitive profiles of 51 savants, examining which cognitive structures underlie and sustain their skills and whether there are commonalities between the cognitive strengths of savants with similar and different kinds of skills.
To this end, the possible relevance to the development of savant skills of factors like attention, memory and practice, as well as familial tendencies indicative of predispositions, has been considered. The conclusion proposed is that the existence of savants is consistent with a theory that some skills are based on relatively well-differentiated neurological capacities, but that these skills do not pose a dilemma for the construct of general intelligence as has been proposed by Gardner (1983), or Howe (1989). This is because the skills developed by savants are generally rule-based, rigid and highly structured, lacking critical aspects of creativity and the cognitive flexibility generally considered to reflect intelligence.

Chapter 5 describes results from a questionnaire presented to the caregivers of the subjects involved in the study in Chapter 4. Questions which developed as the result of the author's experience in working with savants have been specifically addressed. Areas of interest were:

1) Early life-histories of savants.

2) The extent to which savants demonstrate autistic characteristics and other neurological, psychological and behavioural abnormalities.

3) The incidence of high intelligence and specific abilities among family members.

4) The extent to which savants demonstrate more than one skill.

Chapter 6 provides an overview and general discussion of the research presented in the first five chapters. It is concluded that, although many savants do demonstrate autistic characteristics, all savants are not autistic. Nevertheless, there may be commonalities between autism as clinically defined and the development of savant personalities, such as language abnormalities and delay, preoccupation and persistence with area(s) of interest, idiosyncratic divergent profiles of cognitive abilities but always with well-developed memory, particularly associative memory, and the presence of savant-type skills and higher levels of intelligence among family members, to a higher extent than would be expected from normative data. Although no single factor has been isolated which predicts the development of precocious skill in disabled individuals, it is suggested that a combination of these four common tendencies is
necessary for such development to occur. The ability of models of intelligence to accommodate highly developed specific abilities, while allowing for the existence of a discrepancy between these and a general mental capacity is also discussed.