*Brief Communication***Timing and Attention: a Dual-task Experiment from
Binet (1890)****John H. Wearden^{1,2}**¹School of Psychology, University of Keele, Keele, ST5 5BG, UK²Division and Neuroscience and Experimental Psychology, The University of Manchester, Oxford
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Abstract

This note discusses the dual-task study of Binet (1890), where rhythmic presses were perturbed by additional competing tasks such as mental arithmetic. Similarities to more recent work are discussed.

Keywords

Timing, rhythm, dual-task procedure

Alfred Binet (1857–1911) was a giant of early French psychology. Although he is now best known for the development of a test of intelligence with his former student, Théodore Simon, later modified by Terman into the Stanford-Binet test, he had wide interests in psychology and published work on, among other things, hypnotism, personality, calculating prodigies, and sexual fetishism (some of latter was, somewhat confusingly for the modern reader, published in a book entitled *Studies of Experimental Psychology*, Binet, 1888). He was also director of one of the earliest French psychology laboratories, under the auspices of the *École Pratique des Hautes Études* in Paris.

I discuss here an experiment reported in Binet (1890), possibly the earliest use of the dual-task methodology which became popular for studying attention, information-processing and timing almost 100 years later.

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In the experiment “one places in the subject’s hand a closed rubber tube, connected to an apparatus which registers [the pressure exerted]. The subject is asked to press a certain number of times, at a certain rhythm which they should maintain throughout the trial. Then they are asked to carry out, at the same time, some intellectual work, such as to read aloud, to recite a piece of text learned by heart, or to perform a calculation in their head” (Binet, 1890, p. 139, my translation, as are all the other quotes from Binet).

Binet’s participants were trained to perform this task until they could make the responses “with great regularity”. Then “when we ask the subject to carry out, at the same time, intellectual work of a different type [from the timing task], we see that the trace shows several irregularities [...] which illustrate the problem encountered in the subject’s mind by the coexistence of two intellectual operations of different sorts”.

This is shown in Fig. 1. In the upper trace, the experimental participant was required to press at a rate of one press per second, then must add together 19 and 39. In the lower trace, the procedure is the same, but this time the addition was harder, $624 + 498$. Although the figure is less graphically precise than would be ideal, the perturbations of the repeated presses can be clearly seen.

More generally, Binet (1890, p. 142) reports “The slightest of the irregularities seems to be a lengthening of the pauses separating each press. That is what I find myself when I mentally perform an addition, while I repeatedly press, trying to maintain the intervals that I started with”. He notes further that “for other subjects, the lengthening can be a lot greater; sometimes the subject can cease pressing altogether, without wanting to, for two or three seconds”.

Figure 1. Traces of presses on a rubber tube, where the participant attempted to press once per second. Upper panel: effect of superimposing the addition of 19 and 39. Lower panel: effect of superimposing the addition of 624 and 498.

Using an interval production task as a timing baseline upon which non-timing tasks are superimposed has been a common method in more recent times. For example, Fortin and Rousseau (1987) required people to produce a 2-s interval and, in some conditions, a memory search task was administered at the same time. Increasing the memory processing load increased the time produced (see Fortin & Rousseau, 1987, Fig. 2, p. 380). However, the more modern experiments which come closest to those of Binet are reported in Brown (1997).

Brown's general method required participants to repeatedly produce intervals of 2 or 5 s and this task was presented by itself, or at the same time as another task, which was either tracking on a pursuit rotor, visual search, or mental arithmetic. The non-timing tasks performed also could vary in difficulty. For the visual search and mental arithmetic tasks, adding the non-timing tasks lengthened the intervals produced, and also increased their variability, and "increasing nontemporal demands led to a corresponding increase in temporal productions" (Brown, 1997, p. 1129). The lengthening of the times produced, and increases in variability (Binet's "irregularities") are, of course, results very similar to the effects reported in Binet's article.

Binet (1890) also noted that the secondary task he imposed could sometimes perturb the memory of the timing task, when people were required to press a certain number of times. "The subject loses a clear mental impression of the presses that they have made. Often, they cannot report whether they have pressed once less or more than they should have, or whether their responses were regular or not" (p. 143). How dual tasks procedures might affect the memory of the timing task performed seems a neglected issue in modern research, but one which it might be fruitful to study.

Although Binet's article provides a very early example of dual-task methodology in timing experiments, and has clear methodological parallels with work carried out a century or more later, as well as obtaining similar results, reading the article gives the impression that its focus was not on time perception *per se*, but that Binet merely used the rhythmical pressing method as a convenient, and easily measurable, baseline with which to explore his basic aim which, from the title of his, article, was "the competition between psychological states". Which other psychological processes might interfere with timing, or which other processes timing might share common aspects with, has been a topic of much recent, and ongoing, research (see Wearden, 2016, pp. 85–105, for a short review, and Ogden et al., 2019, for a recent example).

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