The concept of function in osteopathy and conventional medicine: a comparative study

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The Concept of Function in Osteopathy and Conventional Medicine:
A Comparative Study

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The Concept of Function in Osteopathy and Conventional Medicine: A Comparative Study

Abstract

This study compares and contrasts the uses of ‘function’ in osteopathy and in a closely related area of conventional medicine, viz., orthopaedic surgery. Function is a fundamental concept in both; but a survey of the literature, and an initial analysis of the language used by practitioners in a sample of case studies, suggests that while orthopaedic surgeons focus on local failures of physiological function (F_{phys}), osteopaths are concerned with such failures in the global context of the whole body (F_{glob}). This is closely related to individual patients’ expectations in relation to their overall ability to function (F_p). The musculo-skeletal system, with which osteopaths are expert, is shown to be particularly significant for understanding F_{phys}, F_{pt} and F_{glob}. These uses of function are further analysed by drawing on the philosophical literature. This is shown to focus, like orthopaedic surgeons, mainly on biological function (F_{biol} which includes F_{phys}). In consequence, it is argued, the philosophical literature has under-emphasised the significance of context in defining functional norms. Certain authors have recognised the importance of context for the functioning of people (i.e. as F_p); in this thesis, by contrast, context is shown to be important in defining functional norms at all levels, including the physiological/biological. In respect of the relationship between osteopathy and conventional medicine, it is concluded that F_{glob} (as employed more by osteopaths) involves explaining the clinical significance of local dysfunction in the broad context of patients’ activities, and F_{phys} (as employed more by orthopaedic surgeons) involves categorising local dysfunction in terms of referential standards. The concept of agency, although not examined in detail, emerges as the key to linking the rôle of context in the meaning of function statements to the intentions and self-perception of patients in clinical practice. Because of the special rôle of the musculo-skeletal system in enacting agency, osteopathy offers particular insights into the contextual nature of function statements.
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achieve its purpose of being a good human being. (Irwin, 1985; Megone, 1998; Megone, 2000)

5.2. The function literature relevant to the study

My purpose in reviewing the literature, as I outlined earlier, is not to provide a meta-analysis of the function literature but to identify accounts that address the issues that I have identified as significant from my analysis of function in osteopathy and conventional medicine. These can be summarised as illness seen primarily as a biological problem, and illness seen primarily as a problem of human living. Embedded within these are the key issues usually addressed in the literature relating to the teleological implications of function ascriptions, the kind of explanation function ascriptions provide, how functions are distinguished from traits that are not functions, and underpinning all of these, the presence or absence of a value structure. How then does the literature deal with these issues, and how does it help to provide a theoretical framework for my findings so far?

There are various ways in which the literature on function can be classified, for example, into aetiological, eliminativist and representational theories. (Bigelow & Pargetter, 1987) Because of the way I have already identified my main areas of interest, and because of my primary focus on the concept of function in osteopathy and health care I will select two key, and frequently cited, papers that take different views on (a) how the teleological implications of function statements should be interpreted, (b) the kind of explanation function statements provide and (c) how an item’s function(s) can be distinguished from its other characteristics that are not functions. In addition, because function statements infer teleology through reference to purpose and goals, theorists must come down on one side of the fence with respect to whether function statements also entail values. The way in which teleology is interpreted will also have a bearing on epistemological and ontological analyses of function.
Teleology therefore, is a key concept in understanding function and Millikan's paper 'In Defence of Proper Functions' (1989) and Cummins's 'Functional Analysis' (1975) take quite different approaches in their understanding of the teleological implications of function ascriptions. Millikan's account is broadly aetiological arguing that we can only know an item's purpose from our knowledge of what it has done in the past. This is not unique to Millikan, nor was she the first to say it – Wright's 1973 paper had already started to map that general area – but it is perhaps the most robust account. Cummins takes a different approach and places function in the context of a higher level capacity. Here we can only know what the function of an item is when we know the system in which it operates and this is understood as enhancing the fitness of the organism, but, unlike the aetiological accounts, it is not dependent on the historical demonstration of benefit.

In limiting my detailed literature review to key texts that analyse two accounts of function in biology, I am not assuming that they are exclusive. A number of authors argue that there are different but complementary accounts of function related to particular areas of study. (see for example, Amundson & Lauder, 1998; Kitcher, 1993; Preston, 1998) As I argue, biology and medical practice are different in important respects and therefore the ways in which they conceptualise function may also be different. This is a limitation for my study as I will have to adapt the literature on biological function and attempt to apply it to clinical practice. Following my review of the literature, I will consider the extent to which these issues resonate with the analysis of function I undertook earlier.

Although I summarised the key issues of function as if they are separate and distinct, there is much overlap between them, for example between teleology and values. In addition, epistemological and ontological questions are implicit in each issue; it is unclear exactly what ontological category function is part of. Is function a property like colour or contractility, or does it describe some kind of relationship between items? Knowing what an item's function is and whether in any particular case it is functioning correctly, is an important epistemological question, and one on which conventional medicine is based.
The work on biological function is likely to be most relevant to clinical practice and theory where illness is assumed to be primarily a biological problem. For this to succeed, it is necessary to know what the functions of parts are in order to assess whether particular examples meet the referential standard. Key to that is the epistemological question of knowing what an item’s function is.

The strongest accounts of function are provided by the aetiological theories, that is, those theories that argue that function statements get their explanatory power by referring to how similar activities have benefited an item’s predecessors in the past. It is generally agreed that this idea originated with Larry Wright’s seminal paper “Functions”. (Wright, 1973) Godfrey-Smith for example regards Wright’s idea as paradigmatic for understanding function and almost eulogises over the significance the article has had for later papers on function. (Godfrey-Smith, 1993) In true Kuhnian style, he regards the work of other writers as “the refinement of Wright’s original idea.” (p.196) This poses a challenge to anyone demurring from that position, but if I am wishing to challenge the greater claim, which is that biological function can be applied unproblematically to function concepts as they are used in clinical practice and theory, I will need to examine the functional aetiologist’s claim in some detail.

5.2.1. Illness as a biological problem

If illness is logically dependent on disease and dysfunction, then illness is primarily a biological issue and the practitioner’s main focus will be on defining what the proper functions of organic parts are in order to assess whether in any particular case there is dysfunction and disease. The literature that most strongly supports the view that illness and specifically disease is a biological problem assumes that function can be defined (as opposed to merely conceptualised) as proper function.

5.2.1.1 Proper function

It has already been made clear that one of the principle issues relating to the concept of function in modern biology is how to infer a concept of design that takes account of goal seeking without implying conscious design or intent. This is necessary because it is
difficult to talk about biological matters without explaining parts in terms of what they are designed to do or what their purpose is. As Boorse puts it, "Attributing functions to features of organisms is a favourite activity of biologists." (Boorse, 1976 p.70) The issue is whether it is possible to identify the proper function of various biological items by examining the item's history and evolutionary development.

According to this view, stating that the function of the heart is to pump blood, the biceps muscle to flex and supinate the forearm, or the lens of the eye to focus images onto the retina, is to say something meaningful about the intrinsic nature and characteristics of hearts, biceps muscles and lenses, which explains why they are there. According to Karen Neander, "Roughly speaking, biological proper functions are effects for which traits were selected by natural selection." (Neander, 1991 p.168) Describing function in this way is claimed to be unambiguous and open to scientific rationalisation. The main features of the proper function account are that:

- proper functions are traits or characteristics that have been selected for in past generations of the organism;
- proper functions are those traits and characteristics that enhance the organism's fitness to survive or reproduce;
- particular traits are passed from a generation that has demonstrated these as a proper function to following generations; that is, the species has been shown to benefit;
- proper functions must therefore have the "right kind of history" (Millikan), that is, to have demonstrated some useful or essential characteristic in the past that explains its survival and success today;
- the proper function of a trait is to do whatever it was selected for.

Millikan puts forward a strong case for viewing function in an historical context: by taking into account where the organ or organism has come from, its evolutionary history and the role that function has played in the survival of the individual (and more
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particularly of the kind or species of which it is an example), it is possible to infer its proper function. She claims that this kind of theory will differentiate proper functions – those characteristics that are selected on the basis of the contribution they make to survival or reproduction – from other properties that have not been selected. So, the proper function of the heart is said to be to pump blood rather than to produce heart sounds, on the basis that it can be shown that in the past pumping blood has contributed both to the fitness and the survival of the creature whereas producing heart sounds does not have such a history even though in recent time, heart sounds have been used as indicators of the health of a heart. The theory is testable – removing hearts or modifying the way they operate results in the observation that fitness or survival is impaired.

Millikan describes her definition of proper function as “recursive”:

Putting things very roughly, for an item A to have a function F as a “proper function”, it is necessary (and close to sufficient) that one of these two conditions should hold. (1) A originated as a “reproduction” (to give an example, as a copy, or a copy of a copy) of some prior item or items that, due in part to possession of the properties reproduced, have actually performed F in the past, and A exists because (causally historically because) of this or these performances. (2) A originated as the product of some prior device that, given its circumstances, had performance of F as a proper function and that, under those circumstances, normally causes F to be performed by means of producing an item like A. Items that fall under condition (2) have “derived proper functions”, functions derived from the functions of the devices that produce them. (p. 288-9)

An example of (1) would be the function of the heart to pump blood; The heart originated as a (genetically organised) copy of a parental heart that had actually pumped blood in the past. The fact that it had pumped blood in the parent is a cause of this heart existing now. Pumping blood contributed to the survival and reproduction both of the creature and its organ, heart.

An example of (2) would be the movement of a rabbit’s tail to warn other rabbits of danger. Tails have a (derived) proper function because moving tails to warn other rabbits
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is a proper function of the rabbit, because it has contributed to the survival of rabbits in the past. This function is performed by means of tails.

Millikan defends the basic plan, "which looks to the history of an item to determine its function rather than to the item's present properties or dispositions," as preferable to providing a definition of proper functions per se. (p. 288) She argues that other accounts of functions, such as those of Larry Wright and Andrew Woodfield, are conceptual analyses. (Woodfield, 1976; Wright, 1973)

Instead, Millikan describes a theoretical definition, which she sees to be distinct from a stipulative or descriptive definition (though she fails to make clear the difference between stipulative and descriptive). By theoretical rather than descriptive definition, she claims to be describing the theory underlying the description rather than describing the identifying characteristics. Wright, for example, on Millikan's view provides a descriptive definition in that he defines function in terms of the following formula:

The function of X is Z iff:

1. Z is a consequence (result) of X's being there.
2. X is there because it does (results in) Z (ibid. p. 81)

The attempt by Wright and others appears to gain an intellectual hold on the concept of function by reducing it to a basic formula. Millikan on the other hand eschews this approach and attempts to define function in general by identifying (what she terms) proper functions. Once proper functions have been understood, then all concepts of function, and those derived from it, fall into place behind it. She draws a parallel with the scientist who defines water by saying that it is HOH, or the medical scientist who says that consumption was a general name for a number of respiratory conditions, of which tuberculosis was the main one. Proper function may "be read as a theoretical definition of 'purpose'." (p. 291) Her claim is that "'Has a function' does as a matter of fact correspond, in a surprising diversity of cases, to having a proper function." (ibid.) If her approach is followed, then function statements divide into proper functions and what Peter Achinstein
has described as *use functions*, (Achinstein, 1977 p.14) that is, particular uses to which things are put such as noses being used to support spectacles and so on. Presumably this would also include the turtle's use of forelimbs for digging as distinct from their proper function of swimming. (Sober, 1993)

Karen Neander in defending conceptual analysis, comments on Millikan's denial of the usefulness of an analytic account and wonders whether perhaps she is assuming that an account of necessary and sufficient conditions for the application of functional terms is an essential part of the analytic task. This, she suggests is a narrow reading of conceptual analysis.

Millikan's touch stone for a successful account of functional explanations is whether it is able to deal with the problem of things that are said to have functions but fail actually to achieve them – the mating display that fails to attract a mate or the diseased heart that fails to pump blood, for instance. 65

At the root of her definition of proper function is the historical context. Without the "right sort of history" it cannot have a function. (p. 292) By "right sort of history" she means a history that has demonstrated the usefulness of the trait in the past. To support her case she offers the following scenario by asking us to imagine something that clearly has a proper function or purpose and then to

consider a double of it, molecule for molecule exactly the same. Now suppose that this double has just come into being through a cosmic accident resulting in the sudden spontaneous convergence of molecules which, until a moment ago, had been scattered about in random motion. Such a double has no proper functions because its history is not right. It is not a reproduction of anything, nor has it been produced by anything having proper functions. Suppose, for example, that this double is our double. Suddenly it is

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65 These closely follow Wright's key issues, but Millikan claims that she was unaware of Wright's paper when she wrote hers. (Millikan, 1993)
sitting right there beside you. The thing that appears to be its heart does not, in fact, have circulating blood as a proper function, and when it scratches where it itches, the scratching has no proper function. (p. 292)

The point she makes is that without history to show what is or is not a purpose, an action cannot have a proper function. It is an epistemological point, how else can we know what an item’s “proper”, i.e. genuine function is unless we have seen that it actually does confer benefit or a particular kind onto an organism. Without history to demonstrate the genuineness of the function the organism has only characteristics, properties or behaviours. The mistake she argues, is in assuming that these properties are an infallible index of proper function. Just because in our world complex mechanisms do not just appear and that in our world there do not

*in fact* exist complicated goal-directed items, or items displaying complicated negative feedback mechanisms, or items that do anything like ‘registering’ situations ... that do not *in fact* have corresponding proper functions. Having the right sorts of current properties and dispositions is in point of fact in our world, an infallible index of having proper functions.” (p. 293)

The mark of having a function is not the same as having a proper function. Millikan is correct to differentiate between properties and functions, and to infer that properties are not marks of function. We must therefore identify what the true index of function is. Millikan’s account invites careful scrutiny because it entails the counter-intuitive idea that an item that fulfils a necessary purpose in an organism, such as the heart pumping blood, cannot be a proper function if it doesn’t have the correct history, even though it might be just like millions of similar items demonstrating the same trait, and which are proper functions.

5.2.1.2 Critique of Millikan’s account of Proper Functions

Millikan’s point about “having the right history” is well made but requires clarification, particularly with regard to what the ‘right history’ is. I will examine this key point in
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some detail. However, there are a number of critical comments that can be made about the account. I will list them before examining them in depth.

- What is meant by "having the right history"?
- The logical dependency between function and natural selection.
- Relying on 'the right history' robs the concept of function of its explanatory power.
- There are basic philosophical issues relating to the is/ought fallacy, and what kind of explanation Millikan's account provides.
- The inference that items have functions.

5.2.1.2.1 Having the "Right History"

The first problem is that the example Millikan describes relates to her example of the "spontaneous convergence" of a creature's double. I will begin by focusing on Millikan's claim that the double wouldn't have a history. It is vital that the idea of the right history is made very clear, as so much of the theory depends upon it. If something did suddenly converge, or 'saltate', to use Boorse's term, it is not true that it wouldn't have a history. It would still have a history; in fact this event would be of such interest that we would actively seek an explanation by examining its history. It would necessarily have come from somewhere; Millikan is not suggesting that spontaneous creation has occurred, only a reorganisation of pre-existing molecules.66

The difference between Millikan's scenario and what usually happens when particular plants and creatures come into being is, in part at least, a question of time-scale. Every

66 In addition, and this is perhaps a trivial objection, she relies upon a concept of random which itself is open to question. To describe a process as "random", "spontaneous convergence" or "by chance" is to say no more than that we don't know whether there are any organising concepts and that if there are, we don't know what they might be. We therefore couldn't know whether or not selection of some (unrecognised) kind had occurred.
rabbit, daisy or human being is a reorganisation or convergence of previously 'randomly'-scattered molecules. The significant difference for Millikan, is that the converging molecules have "the right sort of history", which appears to depend on a theory of survival and biological fitness. Only where a trait has contributed to survival or reproduction is it a proper function. But those particular converging molecules haven't "properly contributed" to the survival of this organism any more than one that spontaneously converges.

Millikan’s definition of proper function is ambiguous. In (1) she says, in effect, that A is a reproduction or copy of an item(s) that has had properties that have contributed to that item’s reproduction or survival and that A exists because of those properties. What is not clear is how far back we are to go. Does this only refer to the immediate parents? But the immediate parents may not have had A or actually performed function F. In the case of a characteristic associated with a recessive gene, that characteristic and its functional capabilities may not appear for a number of generations. When it is apparent, it will still have a function, but the trait (as distinct from the gene that is responsible for it) is not demonstrated over successive generations. Does (1) therefore refer to the first time that this trait contributed to survival? It is not clear, but it is important that it is clarified because of the examples like the following: Left-handedness does not in itself have a function – it is not usual to refer to left-handedness as having the function of ... In fact in a right-handed world it is a positive disadvantage to be left-handed. Yet it has been argued that the continued existence of left-handedness can be accounted for because in the past, battles centred around castles have given left-handed attackers an advantage when using swords in an attack up a winding staircase. Staircases in castles always wind clockwise to give an advantage to the right-handed defender going down the staircase, when the arm with the sword has more room on the outside of the curve. Despite this clear case of left-handedness being an aid to survival, left-handedness is not ascribed the function of ‘wielding swords going up a right-hand staircase.’
In fact a stronger case can be made; there is a castle in Scotland— I forget exactly where— that has staircases that wind anti-clockwise. This is because a majority of men in that area were left-handed. Let us surmise that the existence of this population was due to the fact that in the past left handed soldiers had successfully attacked the area and survived in the locality. Clearly if this is true, left handedness would have aided survival and been passed on to further generations, but I think it unlikely that any biologist would describe left handedness as a function.

Let us accept that Millikan’s double is a rabbit in which moving its tail does not have the proper function of warning other rabbits. If this ‘rabbit’ reproduces, or clones itself and its offspring move their tails and other rabbits run down into their burrows in response, does this give the ‘rabbit’s’ tail a proper function? Presumably not, because according to (2) this behaviour must have originated as the product of something with a proper function.

5.2.1.2.1.1. The epistemological problem of knowing what a trait was selected for

It seems that not all traits that aid survival over succeeding generations necessarily become “proper” functions. How can a biologist know that a particular trait has contributed to survival, fitness or reproduction? There is a danger of making the unsubstantiated assumption that because it exists now it must necessarily have been selected. On this basis, existence is a mark of selection. As I will show, this assumption cannot be justified as epiphenomenal traits may exist.

We are necessarily talking about events that occurred in the past and which therefore can be examined only indirectly. Biologists can experiment on items in the present to see how they turn out in the future, but when examining past events they cannot know what would have happened if trait \( p \) had occurred which was different from that which actually occurred, \( q \). We can only know that \( q \) is the unique trait that contributed to reproduction, fitness or survival by inference from observing the effects of actions carried out now; but that isn’t assessing from history.
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Popper might describe the account as an example of pseudo-science on the grounds that it is not possible to falsify any conclusion experimentally. This problem bedevils much of the theory behind evolution; because evolution occurs so slowly and is dependent on specific, unique conditions that may never happen again, it is not possible, even in principle, to design falsifiable experiments to test some parts of the theory. The biologist is reliant on inductive inference which, although passing tests of reasonableness, do not make the mark with respect to scientific validity.

But perhaps these points are trivial. Millikan’s argument is a strong one and her main point is that, without some kind of demonstration of benefits resulting from behaviour it is not possible to say what the function of that behaviour is. Whether this demonstration must be an historical one is probably contentious.

5.2.1.2.1.2. Genesis of the Right History

The second area needing clarification follows from the argument above: assuming that proper functions only exist once their usefulness has been demonstrated historically, at what point does this occur? The example of the ‘rabbit’ given above has already alluded to this. Presumably, on Millikan’s account, the double would have had to demonstrate that its white tail, seeing eye and beating heart performed actual purposes, rather than just performing a characteristic activity, but how often? Is once enough? If it is, wouldn’t that mean that the tree that grows up against the edge of a cliff preventing an avalanche which otherwise would have destroyed it and its offspring, can now pass that action on to its descendants as a proper function even if it never occurs again? Presumably, in evolutionary terms, all functions, such as the ability of ivy to cling to a surface, began as ‘chance’ activities that survived because they benefited the item in some way. This isn’t any different in principle from trees protecting themselves from rock falls by growing up against the cliff-side. I don’t know, but perhaps there is a species of tree that usually grows close to the cliff face and if so, botanists might tell us that the function of that behaviour is to protect the tree. The ‘cheese plant’ in its native environment grows up the trunk of neighbouring tall trees in order to reach the light in the canopy of the forest. The
functional behaviour of the seedling is to seek out the nearest tall tree and begin to climb before its food supply runs out. So when does a useful chance happening such as growing into the shade of a tall tree rather than the light of a clearing in the forest become a proper function? Millikan's account doesn't attempt to answer this question. And why doesn't left-handedness have a function when it can aid survival in an environment of castles?

In fact, I think that Millikan's example can be turned round to show how she is wrong. Suppose her spontaneously converged rabbit, instead of being replicated in the manner she describes, finds itself on the other end of this experiment and transported to another Universe with quite different laws. In this new Universe the physical laws are such that tail bobbing disturbs the atmosphere and causes a lightning strike, and the grass is poisonous to rabbits. The question is, would we want to say anything about what the function of tail bobbing and grass eating is in this rabbit? On Millikan's analysis, if someone asked what the function of the rabbit's tail bobbing was, we would be forced to say that it was to warn other rabbits of impending danger and that grass eating was to gain nourishment because those are the ways in which benefit has been demonstrated in the past. The questioner, if he was a native of that universe, would be unable to make any sense of this answer because in that Universe these activities clearly have no function at all, in fact they are potentially harmful.

I accept that, in part, this counter-example supports Millikan's case because it demonstrates that, just because something looks like something else we know that does have beneficial functions, it doesn't necessarily follow that our example must also have those functions. Millikan's double may previously have existed in a world where there were no predators and so tail bobbing conferred no benefit or may have had quite a different function. It's wrong therefore to make assumptions about functions without evidence and the only evidence of substance comes from past examples of how the behaviour did in fact benefit the organism. My point is that her account does not provide
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what she is seeking; although it looks to the past to find evidence of benefit, it does not give us an unequivocal means for saying what an item’s proper function is.

My counter-example to Millikan demonstrates two things; first, that animals cannot take their functions with them into a different environment. The behaviour may be the same, but the environmental change means that it no longer provides a function. We might want to say that the rabbit in the new Universe used to have tail bobbing as a function, but that it isn’t relevant any more. Or if turtles evolved into land animals then the function of their forelimbs would be to dig rather than to swim, though it would still be true that the function of the limbs used to be to swim with. If turtles no longer swam and someone said that the function of forelimbs in turtles is to enable them to swim, we would rightly look incredulous and say, “but turtles don’t swim.”

There is a logical point to be made here. Millikan ties her concept of function into similar past examples that have demonstrated that this particular trait enhanced the organism’s survival. But if it makes sense to say that such and such a trait used to be the organism’s function, but it isn’t any more, on what basis does is become used to be? On Millikan’s account today’s function continues to be determined by yesterday’s benefits and therefore its function should be fixed for ever regardless of whether it is ever needed or used. This would make it like the function of artefacts, which, once created by the designer imbues it with that function even if the iron ends up as a door stop or the chair as somewhere to put books. The function of the chair is to sit on even though it never is sat on. The question is whether biological items have functions in the same sense.

The second point that the counter-example makes explicit is the rôle that context plays in function ascriptions. By placing an item whose functions are well known – a rabbit, say – into a completely different environment – where the grass is poisonous and tail bobs cause lightning strikes – it is clear that function ascriptions are dependent on the environment in which activities take place. In principle, this is an extreme example of situations when functions are never needed. Most fire extinguishers never actually function because they are not in an environment where there is a fire. When we say that
the function of a fire extinguisher is to put a fire out, we imply the context in which that would be the case. If we had a world where fire did not exist, fire extinguishers would have no function even if they had been designed to put fires out. Though here the notion of ‘to put fires out’ would not make any sense. Some women don’t have babies, not because their wombs don’t function, but because their partner is sterile, they use contraception or they never have sexual intercourse. The function of the item is explained in the context in which it actually operates and we make judgements about function based on the context. Because Millikan focuses on the behaviour of the item and not the context in which it behaves, she assumes that function is some kind of property of the item. In fact she makes this point explicit when she says that she is concerned with identifying “the right sorts of properties;” (p. 293) Two items with the same behaviour but operating in different circumstances might lead to different outcomes that we might want to describe as different functions.

Perhaps it would be possible to develop the theory to include some account of how and when new behavioural changes which are beneficial become functions, or we could build in a careful description of the environment in which this trait is a proper function. In fact, although Millikan doesn’t mention it, there is an idea in evolutionary theory that might provide her with the demarcation that she is seeking. Waddington, for example discusses the development of evolutionary theory through Darwin, Mendel and on to more complex mathematical descriptions such as those of Haldane and Fisher. (Waddington, 1972) He argues that between an organism’s genotype and its phenotype there is an “epigenetic space”. The epigenetic space consists of genes that operate together in what he terms “chreods” that are “defined by the instructions in the genotype that operate together to produce a system that moves along a stabilised time trajectory.” Genes, on this view, do not operate as independent atomic instructions, but in clusters linked to particular complex characteristics. Waddington argues that numerous chreods exist as genotypes but are expressed as phenotypes only when the environmental conditions require. This means in effect that, given a change in the environment that stresses the organism, a species does not have to wait for a mutation to occur that happens to be
useful, instead the appropriate chreod is stimulated to produce a phenotype change that is better adapted. For a creature, such as a horse, to be able to run faster, not only must it have longer and stronger legs, it must have the circulation and lung capacity to support the increased demand. According to this theory, these characteristics are all supported within a single chreod. The experimental evidence suggest that over one or two generations in the new stressful conditions a successful adaptation appears, which, if the stress is removed, disappears again. However, over a number of generations, this new phenotype becomes a permanent feature of the organism. Other evolutionary theories with the operation of genes in complex groups or cascades of behaviour at their heart have been suggested to explain the uneven developments that occur in the evolution of species. (Schwartz, 1999) Recent announcements from the Genome Project reporting that there may be as few as 30,000 genes in the human body suggests that the link between individual genes and body characteristics is both much more subtle and complex than was originally thought.

Whether or not this is how natural selection operates within evolution is not the point here. If it is true, it would show how an adaptive feature could become a permanent part of the phenotype and, on Millikan’s account, a proper function. So let’s assume for the moment that it is possible to say exactly when a random adaptation becomes a permanent selected characteristic; after three generations, say. Subsequently, because there is a significant subspecies better adapted to the new environment because of the new trait, the characteristic can be said to be a proper function.

This might appear to weaken my criticism, for the first two or three generations do not demonstrate the genotype/phenotype stability that is necessary to define a new behaviour as a proper function. But, if the environmental changes that precipitated the chreod’s expression continues over several generations, it does become a permanent characteristic and therefore a proper function. But overcoming this part of the theory only creates other difficulties because of the way chreods, or something like them, entail the effects of many individual genes. Once we entertain the idea of chreods as activated
or inactive groups of genes we must presumably also entertain the idea of potential and actual proper functions. Here 'potential' is different from the usual way in which potential function is conceptualised, because it is potential at a genetic not phenotypic level. Potential function is usually taken to mean a function such as a bee sting that is never actually used but has the potential to function if the circumstances require it. On this genetic view once the organism exists, the potential for a different function to take place has gone until the next generation. Also, we don't know, though presumably at some point in the future we will, either how environmental changes stimulate 'silent' chreods into action, or what it is that causes the development of chreods in the first place. This latter point may be explained in mathematical terms as an effect of the large number of genes and the random variation that can occur when they interact with each other. What this would mean for proper function is to place less weight on the process of natural selection and more on the appropriate 'fit' between chreod expression and environmental stress – matching the phenotype to the environment. This is not to say that natural selection does not take place, but that it is part of a much more complex mechanism that entails genetic expression and the environmental context that precipitates the epigenetic change.

This weakens the proper function argument because it links genetic inheritance, not with the selection process as such, but with the environmental stressor that precipitates the activity of the chreod. It means that the history of an item is only significant if the conditions that precipitated the chreod are still the same. Otherwise the characteristic would be one that used to be a function. So, again it focuses the main interest on the environment or context in which the characteristic acts.

The chreod or cascade theory also weakens the proper function argument on another count. If chreods, or something similar, are systems of genes acting together to bring about a trait or characteristic, then at times, if not frequently, the same genes will be part of different chreods. This would account for adaptations of functions over time; the turtle's forelimbs that function to swim and then to dig holes in the sand for egg laying,
for example. (Sober, 1993) Swimming and digging must entail common genes though the
organisation of those genes might be different. This parallels the organisation of the
activities themselves; the organised muscles, nerves, respiration, etc., required to swim
are different from the organised muscles, nerves, respiration, etc., that are required to dig,
even though some of them may be the same. If natural selection operates at this
organised genetic level then the only way in which individual items can be ascribed
proper functions is if the context in which they are operating is also stipulated. So
perhaps this more sophisticated version of natural selection, if it is true, does not seriously
undermine my criticism, but changes its focus.

There is, though, a much more serious objection to Millikan’s claim whichever version of
natural selection we take. If, as I have suggested, there is a problem with behaviours that
used to confer benefit, don’t any more and which therefore don’t actually function now,
how is that going to help us distinguish between those items that are functioning
efficiently and those that aren’t? The main force of Millikan’s account is that it provides a
scientific description of the proper functions of biological items that enables us to make
judgements of dysfunction and therefore disease. If some of those functions are
redundant and make no material difference to an organism’s health whether or not they
are functioning, i.e., they cannot, even in principle, confer benefits any more, then how
does knowing their selection history and how they may have conferred benefit in the past
be of any help now? In order to make that judgement, we need to know not only the
characteristic that was selected in the past but also the context that made that
characteristic a beneficial adaptation. We then need to compare that context with the
current one in order to discover whether an item is functioning effectively. Again this
would shift the focus onto the environment, as the changed factor, rather than the
characteristic behaviour of the organism, which in this case is static.

5.2.1.2.2 The logical relationship between
selection and proper function

The proper function account rests on three assumptions: 1 that the trait has been selected
in the past; 2 that the trait confers some benefit to the organism; and 3 that the benefit is
interpreted in terms of survival/reproduction. These three assumptions have been conflated into a single notion, which is that function statements explain the presence of a trait (and therefore the organism) because the trait is necessary for the survival of the organism and because the trait has been selected in the past. As I noted above this means that the concept of function is logically wedded to the fact of a trait's selection – on Millikan's account, unless it has been selected in the past (because it confers benefit) it cannot be a proper function, merely a fortuitous benefit. The problem is that this account does not make clear exactly what function rests on, whether it is the fact of selection or the fact of the benefit that forms the basis of selection. Saying that a characteristic has been selected is not the same as saying it has a function as the cases of hymens, vestigial organs and left-handedness demonstrate. In each of these three cases, the fact that they exist now presumably means either that they were once selected, or that they were side-effects of other characteristics that were selected.

If proper functions are traits that are necessary for certain effects that benefit the organism, and which have been demonstrated historically, then the focus is not on whether (or not) a trait has been selected, but on the acknowledgement that it has benefited the organism (or species) by improving fitness, enhancing survival or aiding reproduction. In this case, function is related to benefit through selection rather than relating to selection per se. Admitting this undermines the purpose of those who advocate proper function based on natural selection, distinguishing between fortuitous and proper beneficial behaviours. Usefulness and benefit are not infallible guides to function, as the example of heart sounds, noses supporting spectacles and left-handedness demonstrates.

Millikan rightly argues that having the right sort of properties, i.e., those that contribute to some goal, does not mean that those properties are necessarily proper functions, even though in our world the existence of the right sort of properties in fact coincides with having proper functions. This could be because the properties or "marks" that are associated with proper functions (such as those that enhance survival or aid reproduction) just happen to be the sort that are selected because of their usefulness.
Admitting this emphasises again the benefit of the property not its selection. Perhaps it is possible to define function in terms of benefit and selection; for example, a proper function is any trait that enhances the organism's fitness to survive or reproduce and which has been selected for in past generations of the organism. The problem for the 'and' is that it leaves us with the problem of malfunctions, failed functions and functions that are never required. If they don't actually benefit the organism (or enhance its survival) they can't be proper functions. This was the problem that selection was intended to overcome.

There is another assumption that appears to have been overlooked which is that the fact of selection is assumed to be a valid perhaps even infallible index of benefit. A useful parallel here is with the current emphasis on outcome measures in all walks of life, including educational assessments. If I want to know whether a student has a good knowledge of, say, anatomy, I can set him an examination. The purpose of the exam is to assess how much anatomy he knows. Subsequently, if someone wants to know whether a student has a good knowledge of anatomy, the student can point to his exam result as 'proof' of his knowledge. A 'good' school is assumed to be one that has good examination results, or OFSTED report. A good University is one that comes out well in its RAE assessment, and so on. Of course the validity and reliability of the assessment is paramount in such cases and some are better than others in this respect. But even if the assessment has high validity and reliability, there are still factors that may lead to a false result, and, in addition, there is a shelf-life to the results. All a written examination can tell with certainty (assuming it is valid and reliable) is that when the exam was taken the person knew enough about the questions that were asked to demonstrate that they had good knowledge of that part of the subject the questions referred to. Whether they still knew it a week later, and whether it was correct to infer that they must also know about areas that were not specifically asked, or could apply the knowledge in a different context, is much less secure.

Basing benefit on selection suffers from the same inductive issues. Quite apart from the problems of identifying what selection refers to, which are inherent in the concept of
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selection, we can have little confidence in the idea that only characteristics that benefit are selected or that everything that is selected enhances the organisms fitness to survive. The concept of natural selection depends on the fact that there is variation within and between species and that from time to time new traits emerge that confer advantages to one group over another. This also means that there must be occasions when beneficial traits appear that are not passed on, i.e., do not confer benefit because, for example, the gene is recessive and not passed on during reproduction or the organism fails to reproduce; and when the circumstances are such that the trait does not in fact confer benefit – the sting does not have to work because there are no predators or a light sensitive cell develops in an animal that lives underground for example. There will be situations when the environment changes and a benefit in a cold climate, or a malarial area is not passed on due to the environment warming up (or the species migrating) or the mosquito dying out. In addition, traits may be selected that do not confer benefits, for example they may be secondary to other selected effects, or they are selected due to a temporary changes in the climate but quickly become redundant.

5.2.1.2.2.1. Function as a Selected Trait

By equating the function of an item with “that which it was selected for”, function resides within the item and is reproduced when the item is reproduced. Hearts, livers and blood cells on this reading, have functions; these items are there and they are important, because certain function properties are an essential part of them. A function property is that characteristic or trait that brings about a state necessary for the survival and/or reproduction of the species. So the function property of the heart is a complex combination of the ability of its muscle to contract, plus the physical arrangement of that muscle to form chambers that can therefore change in size thus performing a pumping action. All other properties are incidental, such as the weight, colour, sound, texture and so on. As long as the function properties are preserved it makes no difference whether it is green, twice its weight or makes a noise like a bagpipe; the existence of the heart is explained in the same way, that is, by its function of pumping blood.
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I wish to demur to this assumption. It might appear self-evident that natural selection is conceptually linked with the concept of biological function. The basis of natural selection is that certain traits in an organism are selectively passed on to future generations because the survival of those organisms exhibiting the trait is enhanced. These traits are thus said to serve a purpose, that is, they have a function and that function is to enhance the survival of the organism in some way yet to be defined. It is important to note here that the primary focus of the account is on the characteristic or trait of the item that is said to be functioning, in this case the pumping capability of the heart. Significantly, as I will claim later, it is not on the purpose or goal that is being brought about, though that is implicit.

If it is true that a function is that characteristic or trait that enhances the survival or reproduction capability of an organism, a point that I am not yet prepared to concede, it follows that to explain what the heart was selected for is to explain its function; this is the basic argument referred to earlier that Sober (1993) amongst others uses. Although not strictly tautological, the argument is analytical, for it starts from the assumption that all biological statements about function describe some kind of survival enhancement; a function is that trait that was selected because it enhanced survival; therefore the presence of a trait is evidence of its selection and if it is there it must have enhanced survival (simply because it still exists) and is therefore a function. Although it makes the internal relationship between function, adaptation and selection clear, it gets us no nearer to defining how we know which particular traits are functions and which are not.

Biologists argue that the fossil record provides a good indication of which characteristics present in current populations are proper functions based on the presence of these characteristics in past generations. Sober points out that the front legs of sea turtles are used both to swim with and to dig in the sand to bury their eggs. (Sober, 1993 p.84) He argues that the proper function of a turtle's front legs is to swim with and digging holes in the sand is simply a useful addition, this assertion is based on the evidence that turtles swam in the sea long before they came out to build nests on land. This raises a further
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problem which I will illustrate from three possible scenarios; first the theory presupposes that front legs didn’t have some other function in an evolutionary form before being used to swim with. If this could be ascertained, it would follow presumably, that this new activity would be its proper function. Second, if sea turtles should become entirely land based in the next few thousand years, would swimming cease to be a function of legs and digging become their function? Third, if it is assumed that functions can change when the circumstances change, an assumption Sober implies, why can’t something have two functions? It suggests that there is some unspoken rule that says that things can only have one function. If so, what is the basis for that? In any case, the fact that legs have the function of swimming appears to be entirely contingent on the context of the turtle’s existence. The conventional accounts are ambiguous over whether the focus for knowing what an item’s proper function is, is defined by what it has done in the past – distant past or immediate past – how it actually benefits the organism, or how it is currently being used.

The second problem relating to Sober’s assertion that we can discover the function of an item from the historical record, is that the fossil record is not usually as informative as it is in this case. The example of the sea turtle’s legs is the exception rather than the rule. Specifically, we have little or no information about soft tissues in the fossil record. Without the ability to delve back into fossil history how is function to be known? To these can be added the question, what is served by our being able to say that the proper function of the turtle’s forelimbs is to swim rather than to dig? If it lost the ability to dig it would prevent it protecting its eggs and so reproduction would be threatened. In this

67 In fact this can’t be as any number of examples amply illustrate. The skin has several functions, protection from minor traumas and pathogens, minimising heat loss in the cold and a way of losing heat in high temperatures, providing a basis for touch senses as well as its aesthetic value in mating behaviour. The intervertebral disc functions as a shock absorbent cushion, it distributes weight bearing pressures sideways, and separates the vertebrae to allow movement.
case we would describe it as a loss of function - whether it was a proper function or some secondary function in this case would be quite irrelevant.

Finally, there is the fact that the species has changed, Sober is not comparing like with like. The sea turtle that swam only in the sea was not the same as the one that has emerged on dry land - whether they would be genetically similar enough to mate is unknown and not the point here; if today there were two populations of turtles one that lived entirely in the sea and another that came onto the land to breed, they would be identified as being distinct (sub)species. Presumably one of the distinguishing features of the new land-based creature is its nesting on the beach, in which case the use of front legs to dig holes with is exactly the mark of adaptation that Sober is looking for, so why the reluctance to assign it as a proper function? This is another example of the ambiguity over what exactly informs the identification of function from the various properties of an item and the various contexts in which it operates. This leads us onto the function benchmark, which is, according to Sober, the ability to adapt in order to survive where survival is the measurable outcome.

Why is survival regarded as the benchmark for adaptation? Presumably because human beings feel, and observe other forms of life to possess, an inherent drive to carry on living. But what does survival mean; to what does survival refer – at least in the sense in which it is meant in the context of evolutionary theory – and what is it about survival that grants it this ability to define function? This is related to another question that I will examine in more detail later, which is whether fitness, survival and reproduction are the fundamental goals that distinguish organisms.

5.2.1.2.2. Survival

There is a lack of clarity about the use of the term survival in the literature on function. At first sight survival appears to be an uncontroversial concept; if population A consists of individual members with organs that allow it to live within a given environment and population B lacks them, then there is a strong likelihood that A will survive and go on to reproduce more As while population B goes into decline or dies out because it cannot
compete with $A$. Where an organ or behaviour supplies a trait that facilitates this process, it is described as its function. But what is the focus of survival – who or what is surviving and in what form? In short, what is meant by survival?

It is clearly not the survival of the individual though this may be part of a process towards some other end. All living individuals die and length of life is not necessarily equated with successful selection. Insects form the largest, most diverse and arguably most successfully adapted life form on the planet, but most of them survive only a short time. In fact, in the context of evolutionary adaptation, living a long life can be a disadvantage, for it doesn't allow the gene pool to diversify, or individuals with new abilities to develop. A group that is struggling to adapt to a hostile environment doesn't change generations quickly enough for new advantageous traits to emerge in time to prevent damage to the original group occurring.

So if it is not the individual, perhaps it is the survival of the species or subgroup within the species that is enhanced. But this is also problematical. Let us assume a population $p$ living in environment $e$ where $e$ provides sufficient nutrition, and shelter to support $p$. Due to a climatic change the nature of $e$ changes to $e'$, $e'$ is not sufficient to supply all the nutrition for $p$ which begins to decline in numbers. In time, a small group of individuals within $p$ exhibit a different digestive pattern that enables them to make more efficient use of the nutrition that is available. This subgroup, $p'$, slowly increases in number until it constitutes the major part of $p$. The survival of the species is thus secured by adding a new function to it.

This crude description of natural selection at work models how a species' survival is ensured through successful adaptation. But what has survived is not the original population $p$, but the sub-population $p'$. This may not lead to the demise of species $p$ at the moment, but given further environmental changes and more adaptation, then according to the theory, the time will come when $p''$ is no longer part of species $p$. 
G. C. Williams and Richard Dawkins have argued that it is neither individuals nor species that reproduce, but genes, or more accurately, the DNA in genes. So is survival related to the survival of genetic codes? John Maynard Smith considers this point and concludes that although in one sense genes are 'selfish' (to use Williams and Dawkins' terminology), natural selection does not take place between genes only between organisms. (Smith, 1990 pp. 68-69) Smith repeats the biological maxim that meiosis is fair, that there is an equal probability of one gene being transmitted as its allele, so natural selection cannot take place at this level even though the mechanics of transferred inheritance occurs here.

5.2.1.2.2.3. Ecosystems as a Counterexample to Natural Selection as the Basis for Function Ascriptions

According to proper function theory, function ascriptions are defined by natural selection, i.e., what evolves from the process of natural selection can properly be given the ascription 'function'. What this means is that functions are those traits that have been selected through the causal mechanisms that define natural selection. But those same causal mechanisms operate in circumstances, including biological circumstances, that do not result in function ascriptions. How then are the causal mechanisms behind ecosystems different from those behind other areas of biology?

No one would dispute that ecosystems evolve; in fact they are the very essence of evolution, the laboratory in which it takes place. As environmental conditions change, so ecosystems change and from time to time some disappear altogether and new ones evolve. Ecosystems are therefore subject to the same causal mechanisms of natural selection, though on a larger scale, that organisms are. If we examine a pond or a hedge and analyse the ways in which these are maintained, or sustain themselves, we not only see changes occurring, the entry of a predator or the death of a plant, for example, we see the ways in which other items adapt to accommodate it and the 'life' of the hedge and pond goes on. The result of this is the continued existence of the pond or hedge albeit in a slightly modified form. This is no different in principle from what is claimed for natural selection in a species except that we do not say that particular plants animals or insects
have functions in the pond or hedge in the way that we ascribe functions to hearts, livers
and camouflage in animals. We don't say, for example, that the function of birds in
hedges is to eat the insects that would otherwise damage the hedge though that is what
they do. From this it can be argued that birds eating insects is of benefit to the hedge for
without them it would be damaged. So why do we not ascribe functions to the feeding
behaviour of birds in relation to the hedges that they clearly benefit? This example meets
not just one but both of Millikan's criteria for saying that birds eating insects is a function
of birds; it is a reproduction of what previous generations of birds have done and that
same action has demonstrably benefited the hedge; and these birds exist because
generations before them have fed from the insects on the hedge (or ones like it) and that is
why they exist today. There is no obvious reason therefore, on Millikan's theory, why
birds that eat insects in hedges, or trees that prevent soil-erosion, aren't ascribed insect-
eating and soil preservation as (one of) their functions.

Fulford makes a similar point when he argues that the causal processes driving other
forms of evolution, such as meteorological, geological and so on are the same in principle
as those driving biology. (Fulford, 1999) This should not be surprising if, as proponents
of proper function theory advocate, the process is one of natural causation. Why then is
biology and more pertinently, some parts of biology different?

Millikan's account fails crucially at this point for she is unable to show why we ascribe
functions to (some) biological items and not others, such as ecosystems, when the same
(historical selection) conditions apply. In particular she fails to defend the accusation that
function ascriptions entail selecting particular properties in accordance with some as yet
undefined values.

5.2.1.2.2.4. The Logical Link between Proper
Functions and Natural Selection

Millikan's account stipulates that there is a logical link between the concept of proper
function and the concept of natural selection; one is dependent on the other. Imagine that
the theory of natural selection was discovered to be false. It is unlikely that in, say, a
thousand years from now, evolutionary theory based on natural selection will be the same as it is now, but it is likely that our descendants will still talk about functions. In fact there are now alternative interpretations to Darwin’s original theory which would tend to undermine the proper function interpretation as we have it. For example, as outlined in 5.2.1.2.1.2 changes occur in groups of genes as a cascade effect due to certain key genes being linked. (Schwartz, 1999) When such a gene changes it brings about major changes in a whole group of others. This accounts for the fact that evolutionary change appears to occur non-linearly. Whether or not this is true is not the point, the possibility that it or some other theory could be true undermines the certainty implied by linking proper functions with natural selection.

Suppose that the example given by Millikan and others of a world that appeared by spontaneous convergence of molecules is in fact the real explanation of how this or another world began. On her own account there could not then be proper functions. But on the assumption that there are intelligent life forms to observe them, the various behaviours of hearts pumping blood, eyes seeing and musculo-skeletal systems taking avoidance action, would be described as functional behaviours even though they had not been selected, because they would be seen to contribute to goals or ends. This begs the question, ‘is natural selection a necessary part of the concept of proper function?’ I am suggesting that it is not and that some other element is more important in ascribing functions.

5.2.1.2.3 Robbing the concept of its explanatory power

Function statements are important to biology because they explain. What and how they explain is the focus of my analysis. The problem with Millikan’s account is that it forces

68 I recognise here that in Millikan’s eyes I am guilty of conceptual analysis. My point is that she has failed to provide a robust theoretical definition and that the better way forward is to begin with the ways in which terms are actually used.
the counter-intuitive situation of identical creatures having their (identical) behaviour explained in different ways.

Suppose I have two identical tables in front of me. One of these tables was made by Chippendale while the other is an exact replica of it. The reproduction is so good that even if I were an expert, I couldn't be sure which was the genuine article and which the copy. On Millikan's definition, the two are different because they have different histories. Even though, to all intents and purposes the copy looks, feels and behaves exactly like a genuine Chippendale table and even if everyone believed it was, they would simply be wrong. The "right sorts of current properties and dispositions" would not be "an infallible index" (to use Millikan's terms) to indicate whether it was or wasn't a Chippendale. We can accept that two pieces of furniture that look the same actually are different because they do not have the same origins. This appears to support Millikan's thesis, but more careful analysis reveals the same counter-intuitions that biological items have. Chippendale designed features that he incorporated into his tables - items that had particular functions, concealed drawers or leaf extension perhaps. Let us also assume that the replica copies these features exactly. If we now compare the function of the leaf extension in one with the function of the leaf extension in the other we would not say that one had a function but the other hadn't. The tables are different because one was actually made by Chippendale and the other not, but their functions are the same. Differentiating which table was genuine clearly would be a matter of having the right history, but this wouldn't affect their function.

Millikan's purpose in introducing the "spontaneous convergence" example is to bring in the concept of designed purpose or goal without also inferring designed intention. Evolutionary natural selection is the equivalent in biology of intentional design in artefacts, they explain why the items exist. If they are equivalent, designers' intentions and natural selection, both of which are historical, should be subject to the same conditions when it comes to explaining how they relate to the items' current functions. As my example shows, there are no fundamental differences between biological and
artefact concepts of function in this respect, and Millikan is therefore wrong to insist that they be treated differently.

5.2.1.3 Concluding comments on “proper function”

Chapter 2 concluded that the concept of function is logically linked to concepts of disease and illness, but for disease to be a scientific value-free concept, the concept of function that informs it also has to be value-free. The strongest claims to provide a value-free account of function have been offered by Christopher Boorse, who argues for a biostatistical theory based on species-typical behaviour, and Ruth Millikan who bases her theory on evolution and natural selection. Boorse’s account has been criticised by a number of theorists, (Agich, 1983; De Vito, 2000; Engelhardt, 1984; Fulford, 1989; Nordenfelt, 1995b; van der Steen & Thung, 1988) but Millikan’s has not received as much attention.

I have tried to show that the notion of “having the right history” is not strong enough to support the weight of a value-free account of function, dysfunction and disease. In the end it fails because it doesn’t take enough account of the rôle that context plays in function ascriptions. The historical context that she claims provides evidence of function, is not necessarily the same as the current (and future) environmental context in which present day function is being assessed. If illness is primarily a biological problem a much stronger scientific account of function is required.

5.2.2. Illness as a problem of human-living

The contrasting view is that health problems are primarily problems of human living in which human goals and activities are prevented by particular states. Here the focus is not on the proper behaviour of biological parts, but on the overall behaviour of the organism.

5.2.2.1 Intrasystemic analysis of function

Robert Cummins’s account of function ascriptions (1975, 1996) focuses on function as the capacity of systems rather than a property or trait. He begins by questioning the
assumption that function statements answer the question, ‘why is $x$ there?’ where $x$ is a biological trait.

Cummins argues that this assumption characterises most if not all accounts of function (up to the time of his writing), in particular the deductive-nomological analyses of Hempel and Nagel. He links it with a further assumption about the effects of functions, which he presents as follows:

A. The point of functional characterisation in science is to explain the presence of the item (organ, mechanism, process, or whatever) that is functionally characterised.

B. For something to perform its function is for it to have certain effects on a containing system, which effects contribute to the performance of some activity of, or the maintenance of some condition in, that containing system.

Putting these two assumptions together, we have: a function-ascripting statement explains the presence of the functionally characterised item $i$ in a system $s$ by pointing out that $i$ is present in $s$ because it has certain effects on $s$. (Cummins, 1975 p.741)

Cummins points out that these assumptions have never been systematically defended philosophically and asks in what sense, as A infers, its function explains the presence of an item. He analyses Nagel's scheme, which defines function ascriptions in terms of necessary conditions, and concludes that

an attempt to explain the presence of something by appeal to what it does – its function – is bound to leave unexplained why something else that does the same thing – a functional equivalent – isn’t there instead. (ibid. p. 742)

He asks what counts as an explanation. Using the heart's function of circulating blood as an example, Cummins concludes that it is not possible to deduce hearts from circulation, other things, such as artificial pumps, could (and do) also circulate blood effectively. Therefore it doesn't follow that function 'explains' the presence of an item where an explanation is 'a species of deductive inference'. But Cummins's main criticism is that
to 'explain' the presence of the heart in vertebrates by appeal to what the heart does is to 'explain' its presence by appeal to factors that are causally irrelevant to its presence. (ibid. p.747)

This is not to say that functions do not explain, only that they don't explain in a scientific sense. Scientific explanations can be applied to functions of artefacts but not of natural items on the grounds that (and using Cummins own example), saying that the function of the gnomon on a sundial, say, is to cast a shadow over the appropriate digit in order to indicate what the time is, explains the presence of the gnomon by giving a reason for its being there. Reason implies rational intent and is therefore not appropriate for naturally occurring items. Cause and function are distinct issues; for instance, Cummins suggests that the 'sundial' found by archaeologists could actually be the result of the roof of an ancient building collapsing and a piece of stone embedding itself into the centre of a Zodiac mosaic set into the floor. Local people, ignorant of its history, simply use the result as an effective timepiece. While it might be correct to say, in the context of the resulting 'sundial', that the gnomon's function is 'to cast a shadow', it clearly does not also infer that 'that is why it is there' in a causal sense. There was never any design or intent about it. With echoes of Hume's critique of causation, Cummins argues that the appeal to function as explanation in natural systems is "an act of desperation born of thinking there is no other explanatory use of functional characterisation in science." (p.747).

The reason for this mistake, according to Cummins, is the failure to distinguish function explanations from teleological explanations. He argues that function explanations are not simply a subcategory of teleological explanations even though "functional concepts do loom large in 'explanations' having a teleological form." (p.747) The reason that function explanations can (and should) be distinguished from teleological explanations is because of the direction of causation. The circulation of blood does not explain the presence of the heart in the sense of explaining how it came to be there – this is a causal explanation – therefore, Cummins argues, function statements are causally irrelevant.
Cummins goes further and argues that the functional effects of an item are quite separate from the genetic plan that gives the item those effects because the plan, i.e., the genetic code, is not altered in order to meet the functional needs of the organism. The actual effects of parts (rather than other possible effects) are not there as the result of a deliberate action on the part of the organism or its genetic code. On the view of all the accounts of function that argue for a logical dependence of function on natural selection, the stimulus that causes the organism to act in a particular way comes from the organism's environment. Particular traits are selected because they confer benefits in the context of the environment in which the organism lives, not because the genetic code alters those effects in response to outside stimuli. Internal parts behave in accordance with their natural properties whether they confer benefits on the organism or not. The need for benefits doesn't cause individual parts to adopt particular functions. The fact that we infer failure to those organisms where benefits are not conferred, are unsuccessful, or die out, appeals to some innate psychological need in us and we impute, a la Hume, a causal relationship between appropriate adaptation to environmental conditions and the events that cause items to have the right kind of disposition or property to adapt to those conditions. So we want to say, for example, that the dodo died out because its preservation instincts didn't adapt appropriately to the presence of hungry sailors. But the literal meaning of that statement, for any individual Dodo is biological nonsense – the Dodo's preservation instinct is merely the result of natural internal mechanisms. The confusion rests on the slide from 'Dodo' as a particular individual creature, to 'Dodo' as the term describing a whole species. A species can only change its behaviour if new and different individuals are added to it. What causes individuals within a population to be different from each other is a separate issue from what the most appropriate behaviour in a particular environmental circumstance might be.

Cummins's point is supported by the simple fact that natural selection in sexual organisms requires two or more individuals for selection to be inherited, and therefore cannot occur at the level of the individual organism. The events that occur within an organism and the functional benefits of those events are distinct from what caused those
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particular events to be present. The general point, made by Millikan, was that properties do not provide infallible indexes of function even though in most cases in our world properties happen to mark function. But Cummins’s criticism goes further, applying to all aetiological theories, including proper functions, by assuming that function statements explain the presence of an item from knowledge of what it was selected for. The cause of a trait explains why it is there today because natural selection implies cause.

Cummins’s criticism of the claim that function explains the presence of a trait is therefore twofold: ascribing functions to traits does not explain them in a scientific sense because it is not possible to deduce the trait from the effect; and second, the cause and the function of an item are distinct issues in biology.

While this is a powerful analysis, there are some issues that are unclear. Cummins is using a narrow interpretation of ‘explain’ here when he subsumes function ascriptions to scientific explanations. He infers that to explain the presence of an item scientifically is to say what caused it and is taking ‘why is x there?’ to mean ‘what has caused x?’ But this is not the only way in which we commonly use the term ‘explain’ and much rests on the context of the question. For example, I might be asked to explain why the car is in the garage. The answer could be any of the following, ‘because Jim drove it in’, or ‘because that is what garages are for’, ‘because I wanted to get it off the road’, ‘because it was raining’ and so on. The first answer, ‘because Jim drove it in’, would only be a ‘scientific’ answer if I am wanting to deduce the presence of the car – if the car is in the garage someone must have put it there, the only person with a key is Jim, therefore Jim must have driven it in. But knowing who put the car there doesn’t tell me very much about cars and garages, and surely this is the point; biological interest in functions is not only concerned with efficient causation but also with understanding what an item does and how it contributes to the nature and existence of the organism. Continuing the Aristotelian conception of cause, biologists are just as, and sometimes more, interested in formal and final cause as they are with material and efficient. This leads on to Cummins’s own analysis of what kind of explanation is provided by function ascriptions.
5.2.2.1.1 Function as a "Containing System"

Cummins places emphasis on the "containing system", that is, the whole organism or a defined system within the organism, rather than on any component item in that organism. He likens it to a production line where a series of individual tasks/events link together in a planned and organised way to produce a finished product. Within the line, particular events work together to produce outcomes that are necessary elements of the capacity of the line to produce the product. So, for example, fitting electrical control systems and painting the product are separate necessary outcomes provided by different parts of the production line. Cummins sees these as discrete and necessary systems working together to produce the final product. He ascribes the term function to these operational systems because they each have a discrete goal that is determined by the required final outcome. The control system ensures that the item responds in accordance with the designer's intention and the painting protects and provides aesthetic value to the product. But Cummins's main and original point here is that at some operational level below that, individual items are explained, not because they perform tasks/events that can only be explained in terms of what is required in the final product, but because that is just what they do. So the air-compressor that works in the painting system is just an air-compressor doing what air-compressors do. The hose that carries the paint is just a hose that could be used in any number of different ways in other production lines. The painting system on the other hand is organised in a particular way because the design of the final product specifies that the paint be of a certain kind and applied in a certain way. Of course, it might also be useful in painting other products, the point though is that its use on this production is quite specific and goal-orientated. The explanation of the system is with reference to the final product, which he refers to as "the capacity" of the production line, while the explanation of the property/disposition of each part is explained in relation to what it is and how it came to be there. These different explanations require different
strategies for uncovering them and these Cummins refers to as an "Analytical Strategy" for explaining function and an "Instantiation Strategy" for explaining dispositions.\(^{69}\)

If we apply this to biological function, we can see that the organism behaves in a certain way and has its own characteristics or traits because of the combined effects of constitutive dispositions. Thus humans, daisies and slugs are each successful not because of what individual cells in those organisms do, different cells doing the same thing would be just as effective, but because the total capacity of the whole system enables the organism to fulfill its goals. Systems are goal specific, that is, they are defined by a final goal. The fact that component cells happen to do the kinds of things that gives an organism its particular characteristic, is simply a statement of fact.

Cummins's refined view is formulated as follows:

The (or a) function of \(x\) in a system \(\Sigma\) is \(f\) relative to a capacity \(C\) of \(\Sigma\) just in case \(\Sigma\)'s capacity to \(C\) analyses (in part) into \(x\)'s capacity to \(f\). (Cummins, 1996 p.116)

The result is an explanatory scheme that distinguishes between the integrated characteristics of goal-directed systems and the properties of the constituent parts that form the system. In biological terms it distinguishes function from physiology, where function is explained by an Analytical Strategy and physiology by an Instantiation Strategy. Cummins's argument is this: systems perform the necessary activities of organisms by providing the organism with a particular capacity that is necessary for their survival. This capacity, the capacity of the heart to pump blood for example, results in an event, blood being pumped around the body. This capacity of a system can be analysed into the effects of a number of component capacities in the same way that the capacity of a production line to produce an object can be analysed into the effects of those events on the

\(^{69}\) Cummins revised his original 1975 paper in subsequent reprints and used the term "Instantiation Strategy" rather the original "Subsumption Strategy". He regarded instantiation as more definitive.
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production line that in fact results in the object being produced. The function of each event on the line is analysed according to its contribution to the final result. The effects of the system components are given function ascriptions because function refers to the fact that the component brings about the event that is the capacity of the contained system. Events, therefore, only have functions in the context of the capacity of the system.

When these constitutive components come to be explained, they only have functional significance in the context of the system in which they are operating. So a screw in an engine only has a function in the context of the engine. On its own, it simply has certain properties. Because dispositions are properties and not events, explaining a disposition requires knowing how it is instantiated. The interest here is in what an item is disposed to do, which is a physiological question. This results in a splitting of physiology from function where function refers to the capacity of systems, such as the cardiovascular system, and physiology is interested in the disposition (and how it comes about) of those items/events that bring that capacity about, such as muscle cells or nerve conduction. Of course, in reality, biologists jump between the two, but that is part of Cummins’s point, insufficient philosophical analysis has gone into examining just what is entailed by these terms.

So, to use a straightforward example, the function of the biceps brachii muscle is to flex the elbow and shoulder and to supinate the forearm. However, on Cummins’s analysis, when it comes to explaining the component events such as muscle cells, spindles, actin and myosin etc., the analytical strategy is strained because the interest here is not in what the muscle system brings about, but in the properties of the component parts that are necessary for it to happen. At this point pursuing physiological questions about muscle fibres and nerve receptors provides the best explanatory strategy and this, according to Cummins, is an instantiation issue. Explaining the chemical bonding between actin and myosin in muscle filaments does not require knowledge of how the muscle benefits the organism, on the contrary, it is quite possible to study the filament in isolation without any reference to function at all. So, contrary to most dictionary definitions (for example,
Walton, Beeson & Scott, 1986 p.1077), physiology is not the straight-forward study of function. If Cummins is correct, then function explains the capacity of systems, including the complex arrangement and interaction of the various events that bring it about, and physiology explains the disposition of those component parts to behave in particular ways, including what caused them to be there.

5.2.2.1.2 Criticisms of Cummins's account

Cummins offers a sophisticated and original account of function but it too has its critics. The most serious issue for Cummins is in how he defines a system. He appears merely to have replaced the problem of knowing which of an item's traits are functions with knowing which systems are functions. This is potentially more problematic for there are far more ways of organising parts into systems than there are properties of parts to assign to functions.

In the first place there are issues about what constitutes a biological system. I will address the issue of systems in more detail in Chapter 6 when I relate them back to clinical practice and theory, but in anticipation, the main issue is in defining the boundaries of a system. Here there is the danger of circularity for body systems have traditionally been classified according to their function, the cardiovascular system circulates blood, the nervous system co-ordinates activities and so on. To use systems as the basis for defining function is not particularly helpful, though Cummins might argue that he is merely providing a theoretical explanation for what is done intuitively.

Cummins is not blind to the problem of distinguishing between functioning and non-functioning systems; in particular he recognises that, in principle, any capacity of a complex system could be subjected to functional analysis. This is due to the fact that he explicitly excludes causal relationships from function, i.e., a trait is not a function because of any causal link with the capacity of the system, but simply because it contributes to and
is necessary for achieving the goals of the system. This means that incidental effects can also be functions. The classic case that is frequently cited is the capacity of the heart to produce sounds which, although useful to cardiologists, is not a function of the heart.\textsuperscript{70} To counter this Cummins proposes three conditions that must be met in order to determine how appropriate it is to assign a function ascription to a capacity.

1. The extent to which the analysing capacities are less sophisticated than the analysed capacities;
2. the extent to which the analysing capacities are different in type from the analysed capacities; and
3. the relative sophistication of the programme appealed to, i.e., the relative complexity of the organisation of the component parts/processes which is attributed to the system. (Cummins, 1975 p.764)

The sophistication of a system is an important criterion for Cummins. In effect, he is equating function with organised complexity which is why functional explanations require an Analytical rather than an Instantiation Strategy. His interest is in the way the organism behaves; functional behaviour refers to the organised way in which a number of dispositions act together to bring about a beneficial goal.

Even with these provisos and conditions, critics of Cummins point out that it is possible to identify systems that meet Cummins's criteria but which are not proper functions of the body. Melander offers the example of angiogenesis in certain cancer tumours. (Melander, 1997 p.53-4) The tumour generates new blood vessels to supply itself with nutrients and oxygen. This is explained by a complex pathway from abnormal gene

\textsuperscript{70} Although heart sounds are frequently cited as a useful but non-function of the heart, strictly speaking it is not an effect of the heart as such. Heart noises are due to the closing of the heart valves in response to the pressure of blood flow. It is therefore the result of an interaction of heart pumping (creating the pressure), the fluid dynamics of blood under pressure and the activity of the valves. The heart on its own makes no noise. But then, cont ...
activity, enzyme production that stimulates the growth of blood vessels and leads to further growth of the tumour. Although this process entails a complex of dispositions and an organised co-ordinated programme in which the analysing capacities are both less 'sophisticated' and different in type, which, on Cummins’s analysis, constitutes a containing system, the production of auto-generative tumours clearly is not a function of the body. But it is a function in consideration of the 'needs' of the tumour. In other words, it depends on what needs or benefits are being considered and what the analysed capacity is considered to be. This is true of a parasite; what is a function for the parasite, even if exactly the same dispositions are occurring, clearly is not for the host and vice versa.

Cummins is reticent about showing how dispositions/properties can sometimes be function capacities and at other times, useful, but incidental capacities. The difference for Cummins appears to rest on the interests of biologists. When a complex characteristic is identified, be it physiological or behavioural, the investigator attempts to explain that behaviour by identifying the various dispositions that contribute to it and to understand the organisation that facilitates the organism's capacity. But what is it that gives a system a functional capacity? This question is left hanging as is another, for Cummins's analysis creates a distinction between biological functions and functions of artefacts in an important respect. When an artefact is made, there is usually some intention behind it. Parts are put together to produce a particular effect. The function of a chair leg is to support the seat, provide stability, have aesthetic value and so on. If the chair becomes redundant and is broken up someone may find and recognise the pieces as coming from a chair. This person might also find another use for it as a shelf support, or reshape it to make it into a dibble. Now if someone enquires what the item is for, the answer will refer

strictly speaking, the heart apart from the blood is not able to be a pump. This point is taken up later.
to its present function – to support the shelf, or to make holes in the garden for bulbs or potatoes – but if the question focuses on what it is, the answer is less clear; now the reply might be, ‘well, it’s an old chair leg, but I’ve made it into a dibble.’ Nothing can take away the fact that its original purpose, what it was made for, was to be a chair leg even though it is not, and very likely will never again be, a chair leg. This re-emphasises the issue that Cummins addresses of distinguishing functional capacity from aetiology – what the dibble does and how it came to be there are separate issues.

With biological function what “having a function” means is less clear and Cummins might want to say that the question is simply mistaken. Biological items cannot be made for a purpose (other than from a theological perspective), though evolutionists would claim that they are selected for a purpose, that purpose being the survival of the species. On Cummins's analysis they simply exist and their properties contribute to a capacity that is of benefit to the organism. Aetiologists, such as Wright, Millikan and Neander would disagree by arguing that it is only possible to know how an item’s behaviour benefits an organism by examining its history and showing that in the past the presence of that behaviour not only was of benefit but that it explains why it is present now.

So what is the question that function statements are trying to answer? Is Cummins mistaken when he wants to disassociate the function from the aetiology of an item? Godfrey-Smith argues that there are two distinct questions, one relates to why an item is there and is answered with reference to aetiology and the other relates to what it does, how it contributes to behaviour that benefits the organism. (Godfrey-Smith, 1993 p.201) Beth Preston also suggests that there may be several different questions being addressed, as do Amundson and Lauder. (Amundson & Lauder, 1998; Preston, 1998)

Function statements, on Cummins’s analysis, do not address the question, ‘why is x there’ if the question is really asking ‘what caused x to be there?’ An item’s function and what has caused it to be there with its particular properties/dispositions, are separate issues. Instead, the question addresses x’s place within a system, where the capacity of the system determines the function ascribed to an event within it. The item, x, has no
function outside the system and further analysis of \( x \) entails a change of strategy, from analysis of its place in the system to an explanation of how it is instantiated, to use Cummins's terms. The effect of this is to create a clear distinction between an item's dispositions/properties and its function. This opens up the possibility that functions are not describing particular properties or dispositions at all but the relationship \( x \) has within the system of which it is a necessary part.

If, as I've concluded from Cummins's analysis, an item \( x \) has no function outside a system, it suggests that its function is not due to any inherent qualities \textit{per se}, but its arrangement within the system. It also suggests that if we are going to distinguish between systems that are functions and those that aren't we will need to look more closely at the concept and make-up of a system.

Cummins's analysis offers some interesting and powerful features. I want, tentatively, to bring from his account, the idea of function as a purposive system of properties/dispositions, bearing in mind that we still have to say what distinguishes biological from non-biological behaviour and as well as proper functions from useful side-effects.

For Cummins then, the question that function ascriptions are trying to answer is not why the item is there, but either what purpose the item's capacity serves, or how its property is exercised in the capacity of a containing system.

\textbf{5.2.2.2 The patient as a functioning agent}

Cummins offers an interesting and original account of function that addresses some of the problems encountered by aetiological theories, particularly knowing which of an item's properties are its function, but unfortunately it has problems of its own. These focus on what is meant by 'a system', an issue I will address in more detail in Chapter 6. To anticipate what I will say there, one of the strengths of Cummins's analysis is that by working from the goal of the organism backwards the concept of function becomes both broader and more flexible. I pointed out in the Introduction that one of the judgements
that practitioners have to make is whether an item that is operating within its normal physiological limits is contributing to a dysfunctional situation. I cited the osteopathic concept of somatic dysfunction as an example of this where normal responses take place in inappropriate situations. Because he starts with the required goal that is of benefit to the organism, Cummins can avoid this problem. He merely sees that the appropriate dispositions are operating to allow the necessary functional capacity to be met. This also allows for compensatory and adaptational mechanisms to be judged as functioning well.

His problem though is in defining what is a proper system. For Cummins, function ascriptions are informed from the level of the organism down to smaller systems rather than from basic functional units up to the level of the organism. If something substantive can be said about this, his analysis offers the possibility for explaining much of what seemed from the Case Studies to be important to practitioners, particularly those in primary care, as well as explaining the functional basis of illness. By working from the level of the organism down, Cummins also makes explicit the idea that the organism is an agent acting within its environment. Whether or not biologists would want to think of organisms in this way, it is an important issue for practitioners and sets a further agenda for the next Chapter.
Chapter 6. Re-examining the Concept of Function in Practice

In Chapter 6 I go on to apply, develop and adapt Cummins's account of systems and properties/dispositions, to the observation, made in Chapter 3, that practitioners use two concepts of function, the physiology of local parts \((F_{\text{phys}})\) and the global actions/agency of the person \((F_{\text{glob}})\).

A key question, requiring further clarification, is what is meant by a system and what the relationship is between systems and the physiological dispositions that constitute them. This makes explicit the rôle of context in defining function and (particularly for practitioners) of dysfunction. The function of artefacts is examined and found to operate in a number of ways, as items with intended function (such as chairs and can-openers), and as items whose capacities can be deployed in a range of functional uses (such as planks and iron bars). It is argued that this parallels function as it is used in practice, but requires a further concept of function to explain the derivation of \(F_{\text{glob}}\). \(F_{\text{pl}}\) denotes the expectations of patients and practitioners of what would normally be taken for granted with respect to actions/agency. \((F_{\text{glob}}\) denotes the actual actions/agency of the individual.) The Chapter also explores the rôle that function plays in linking the concepts of illness and disease.

It is now time to return to the analysis of practice to see if the examination of biological function offers insights. We were left with two notions; that practitioners appear to use the idea that body parts have proper functions which can be tested, and a global notion of incapacity as that which prompts a person to seek professional help. These were evident both in the Case Studies and in the analysis of the concepts of disease and illness.

6.1. The explanatory work of function concepts in biology and in practice

I argued that if medicine is to justify its reliance on the medical model (where it is assumed that disease is explained by pathology and can be investigated scientifically) it would have to find a scientific account of function to back it up. The two accounts that
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seemed to offer the most hope of that were the BST of Christopher Boorse and the “proper function” account of Ruth Millikan. My review of Millikan and the widespread criticism of Boorse suggests that they are unable to meet the rigorous criteria that such an account requires. At crucial points they both entail value-judgements – Boorse by having to start with an intuition of what good health is in order to define his species population, and Millikan because she fails to define the criteria for what constitutes “the right history”.

This is not to say that aetiological accounts cannot be useful both to biologists and practitioners, just that they cannot claim to be value-free scientific concepts, nor to demonstrate a clear advantage in their ability to explain function. Boorse’s BST is essential to conventional medicine but only in a nominalistic framework.

Cummins’s intrasystemic account appears to offer an explanatory framework for understanding the complexity of clinical judgements, but is unclear about what distinguishes true functional systems from other systems with a capacity. In addition it fails to define system, other than as a group of dispositions with a shared capacity.

We are therefore left with the possibility that there is more than one legitimate conceptualisation of function; \( F_{\text{phys}} \) based on some modified concept of proper function focusing on local parts and \( F_{\text{glob}} \) based on a global capacity focusing on the organism. Further work is required to see, first, what ‘system’ might mean in practice, second, how the different accounts of function might be used by different interests, and third, what informs the notion of \( F_{\text{glob}} \).

6.1.1. What defines a system?

At the heart of Cummins’s analysis lies the idea of a system with a capacity. He leaves open important questions concerning what a system consists in (how it is different from an aggregation of elements with a single capacity, for example) and what distinguishes a function system from other systems with a capacity. Although Cummins isn’t explicit about it, the way in which he describes his functional capacities closely parallels many of the ideas emanating out of General Systems Theory. I will therefore spend a little time,
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outlining the main ideas in General Systems Theory before looking at the different interests of biologists, practitioners and patients.

6.1.1.1 General Systems Theory

General Systems Theory (GST) was developed by Ludwig von Bertalanffy in the late 1930s as a way of explaining the complexity and organisation inherent in biology. (von Bertalanffy, 1952) In effect, it addresses the paradox I identified earlier, namely, how organisms differ from physical systems when, at a basic chemical level, their internal mechanisms obey known physical laws, but the organism appears not to be wholly determined by them. Bertalanffy focused on the entropy problem, which is that organisms at a micro and macro level increase their complexity and internal organisation in apparent contravention of Newton's 2nd law of thermodynamics. In addressing some of the same issues, Sommerhoff focused on the goal-seeking adaptive nature of organisms as I mentioned earlier. (Sommerhoff, 1981/1969) The two main themes within GST, therefore, are the internal organisation and integrated wholeness of the organism (or system within the organism) which gives it its goal-seeking capacity, and the distinct ways in which systems interact with their immediate environment (or suprasystem).

Bertalanffy describes systems as being either open or closed, depending on whether they are open to and interact with the environment. He argues that biological systems are open and that they maintain and extend their level of organisation by interacting with the environment through the exchange of energy. Organisms take in energy and basic nutrients, including, for example, oxygen and give out heat and waste (high entropy) products. They maintain their own internal high organisation and low entropy at the expense of their environment. One definition of disease on this account relates to raised entropy levels and reduced levels of internal organisation. (Groër & Shekleton, 1983, pp 4-5) Death ensues when the level of organisation drops to a critically low level. GST describes the relational characteristics of biological parts, that is, the relationship they hold with suprasystems (including the whole organism) in terms of their semi-permeable boundaries, their ability to obtain matter, energy or information essential for growth.
development and maintenance of its life, their ability to maintain their internal processes, and their ability to dispose of harmful or excess matter and energy. (Schuster, 1980 p 34)

On this account, the heart is significant not because it pumps blood *per se*, was selected for its blood pumping capacity or because it has demonstrated its benefit to the organism’s predecessors, but because of the way in which it contributes to the maintenance of high levels of organisation within the organism. Its significance is in its relationship with those tissues that rely on a continuous blood supply, for example.

GST’s order of explanation is different from a reductionist analysis in one important respect; GST sets out to analyse the relationship of parts rather than the quality of the parts themselves. The argument is that complex organisations necessarily entail some kind of relational order because without it the organisation lacks cohesion. Where traditional analytical methods have focused on reducing what is complex to what is simpler by examining parts independently, GST attempts to understand the organisational aspect by examining the nature of the relationship. It can only do this in relation to the whole. Angyal, in a classic paper first published in 1941, explores this difference by comparing a simple relation with a system. (Angyal, 1981/1941) He demonstrates some of the “logical characteristics of systems”, which can be summarised as follows:

- A relation requires two and only two members (relata) between which the relation is established. A complex relation can always be analysed into pairs of relata, while the system cannot be thus analysed. A system may involve an unspecified number of members. ... A system is not a complex relation.

- A relation requires an aspect out of which the relationship is formed. Two objects can be related to each other, for instance with regard to their colour, size or weight. Therefore before a relationship can be established it is necessary to single out some aspect of the relata which serves as a basis of the relation. The attribute of the relata on which the relationship is based is an immanent quality of the object, like size, colour, or weight. The object enters into a relationship with another object because of its immanent qualities. The members of system, on the contrary, do not become constituents of the system by
means of their immanent qualities but by means of their distribution or arrangement within the system. The object does not participate in the system by an inherent quality but by its positional value in the system.

• In establishing a relationship between objects and in arranging objects in a system, the separation of the object is presupposed. Multiplicity of objects is only possible in some kind of dimensional domain (a manifold). The clearest examples of dimensional domains are space and time. ... We cannot speak of two objects unless they are placed in different points of time or in different points of space. ... the rôle of the dimensional domain for a relationship is merely disjunction of the relata. ...in the formation of systems ... the dimensional domain not only separates the parts, but it participates in the formation of the system. The system is dimensional. A system is a distribution of the members in a dimensional domain.

• Considering a straight line with the points a, b, c, d, e, on it. In a relationship the connectedness between the relata is a direct one. The connection goes without any mediation directly from a to b and vice versa. Although (in a system) there is a connection between the points a, b, c, d when they form a straight line, this connection is not a direct one in our sense. It is impossible to say what relationship should connect a with b and c with d and a with d, etc., to form a linear arrangement. In a system the members are, from the holistic viewpoint, not significantly connected with each other except with reference to the whole. The constituent parts of a system are not considered separately but with respect to a superordinate, more inclusive factor, the system in and by which they are connected. (ibid. pp. 30-36 – all italics are the author's)

Angyal argues that the holistic maxim, "the whole is more than the sum of its parts" is misleading because it implies that a summation of parts takes place accompanied by the adding of some new additional factor. This misunderstands the nature of systems. Instead, a whole and different order is created in which summation (or aggregation) takes no part. An aggregation depends for its properties on the inherent qualities of the constituent parts – the linear line extended to points f, g and h, or a new extension added to a house, or more sand added to a pile, etc. When parts are added to a system they do not connect with the system because of their inherent qualities but because of their
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position within the system. “In aggregates it is significant that the parts are added; in a system it is significant that the parts are arranged.” (ibid. p.37)

On this account, atoms and molecules are true systems because the capacity of the whole is not the aggregation of electrons, protons and so on, but the positional relationship each part holds with respect to the whole. If an electron changes its position, the atom changes. In a painting or photograph, each element in the picture is significant not because of any inherent quality, but because of its arrangement with respect to the whole painting. The significance of the flower in the bottom right corner, is not due to its yellow-ness or its triangular shape, but because it ‘balances the picture’ or ‘leads the eye towards some other feature.’ The flower’s significance is to the picture not to any inherent quality. To take this example further, an art critic will look at a picture as a whole not as an aggregation of, say, trees and people. She may criticise it because the person, say, the main focus of the picture, is not dominant enough, by which she means its position or its colouring in respect to the position and colours of the rest of the picture fails to achieve the required outcome. Or she may praise the overall balance of a landscape by which she means that each part relates to each other part through the medium of the whole, in an effective way. The rules of painting composition refer to parts in the context of the whole.

The same is true of music; a minim or a b flat only has significance in the context of the whole piece of music not through any inherent quality of its own. Recall Eric Morecambe’s famous quip that he plays all the right notes but not necessarily in the right order. In music as in drama and joke telling, timing is everything. The fact that the final chord, the dramatic entrance, or the punch line, have their intended effect is only explained with reference to the whole. Historians refer to events in the context of their time to explain why and how they had particular effects. The impact of Pasteur and Koch’s germ theory and the scientific validation of medicine is explained (by some) in the context of other events of the time, including endemic infections, the industrial revolution
with the need for healthy labour and the general climate of scientific investigation. (Porter & Porter, 1989)

GST sets out to understand how organised wholes can be dependent both on the constituent parts and, in the case of open systems, upon the environment (with its whole systems), and yet have a wholeness of their own. The question to be addressed is whether biological organisms are systems in the sense that Angyal describes and whether Cummins’s reference to systems in his analysis can be interpreted in this way. In particular, if function ascriptions entail relationships, which on all the accounts examined so far they do, then do the various parts relate as aggregates, in which case the significance of the relationship will be the addition of the parts; or as systems, in which case the significance of the relationship will be on the arrangement of the parts?

6.1.1.2 Biological Systems

It is natural to talk about systems in the sense of interdependent wholes operating in various walks of life from assembling flat-pack furniture, to understanding the organisation of a big corporation. Biologists refer to body systems and eco-systems; the question is whether these are GST systems and what the boundaries and the internal organisation are. While the boundaries of the system ‘human being’ can be defined (though perhaps not the system ‘person’), it is more usual to limit systems analysis to ‘systems’ within the body, which is how Cummins uses it. Traditionally these are broken down according to their function within the body, the cardiovascular, respiratory, neurological, musculoskeletal systems and so on. Cummins skates over this issue in a footnote:

Indeed, what makes something part of, e.g., the nervous system is that its capacities figure in an analysis of the capacity to respond to external stimuli, co-ordinate movement, etc, Thus there is no question that the glial cells are part of the brain, but there is some question a to whether they are part of the nervous system or merely auxiliary to it. (Cummins, 1975 p.761, footnote 18)
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The problem, to which Cummins alludes in his footnote, is that the demarcation between systems is not as distinct as was once believed. Neither is it clear what leads Cummins to say with such certainty that it is the capacity to respond to external stimuli and coordinate movement that defines this or any other system. For example, the musculoskeletal system cannot be considered as a functioning system apart from the neurological – muscle spindles and tendon receptors provide essential information that sets neurological tone and muscle function is dependent on efferent/motor nerves and so on – and the neurological system has strong causal links with the hormonal – the adrenal gland, which produces adrenaline and cortisone, is a highly adapted part of the nervous system. Study of stress mechanisms reveals the activity of multiple ‘systems’ in body adaptation. (Selye, 1976) No body system functions independently, each one is dependent on every other body system to some extent. In fact this dependence can be seen to exist at the level of organism as well. Individual animals, or a person, may appear to be self-contained and independent – certainly the physical boundaries are well marked – but all are dependent on the environment in which they live for moment to moment existence. All need oxygen and an optimum temperature, for example. The context or external environment in which they live is just as important for the life processes as is the internal environment.

Added to this, there are other ways of dividing the body in order to study it. Nathan suggests that the systems of the body are best categorised in a more intuitive way as the arm, leg, thorax, etc. (Nathan, 1994) He argues that the arm functions as an integrated whole in relation to the activities of the person. A person engages with the world at a primary level by walking, carrying, lifting, etc., not by ventricular contraction or glomerular filtration. This picks up on the views of Korr, which were outlined in Chapter 1, who argues that human life is characterised by ordinary everyday activities not the physiological behaviour of body parts, which are necessary, supportive mechanisms. (Korr, 1970) If systems provide the most appropriate way of conceptualising function then the basis for judging what is or is not a system must be defined. This means, first of all, deciding whether there are proper systems, i.e., genuine systems rather than just
useful ways of categorising body behaviour, which would need to be defined in much the same way that Millikan sets out to define function. If not, and I for one am not convinced that it is possible, even in principle, to describe body systems as real entities, the task is to agree on what criteria systems are defined. It is crucial that this is done in a secure manner for, as I've emphasised several times, much rests on it. On conventional medical theory, function defines dysfunction, dysfunction, disease, and disease illness.

The key problem for GST is that it entails intra- and inter-systemic relationships, particularly in the case of open systems. Not only that, but systems are not defined by their structure as such, i.e., not the 'hard' parts that make them up, but the relationships between the parts and the outcome of the whole system. Thus the system of, say, the eye is not defined by the boundaries of the orbit, but by the outcome of seeing, for it is the outcome that gives meaning to the system.

This takes the practitioner's understanding of a system well beyond that which is usually entailed by physiology. It explicitly places it in context. Nevertheless it is still unclear about what constitutes a proper system that is relevant to our understanding of health and illness rather than some other kind of system that is merely useful.

6.1.1.3 $F_{glob}$ and $F_{pt}$

The fact that it is possible to categorise the body into systems according to different criteria outlines a further problem for Cummins. Systems are human formulations - I believe it was Walter Cannon who pointed out that systems do not exist in nature, they are products of the human mind - and human mental categorisation entails value judgements. By definition open systems are not self-contained independent entities, they interact with one another and with the environment. Values of some kind guide the

71 It is questionable whether closed systems exist at all within the Universe. Everything is subject to heat as well as electromagnetic radiation and subatomic particles that pass through all forms of matter.
demarcation and linkage of systems. Although Cummins's account recognises that the categorisation of systems is determined by the "greater capacity" of the organism, he seems to assume that this "greater capacity" is self-evident. But unless a Boorsian-style description of human capacity can be defined what the greater capacity is will always be contestable.

For practitioners to conceptualise systems (constituted by dispositions but operating within the global "greater capacity" of the individual), there must be a concept to inform the practitioner whether $F_{\text{glob}}$ really is an illness and needs to be modified, i.e., to determine whether the capacity of $F_{\text{glob}}$ is that required for the person to be an effective agent. I have argued that patients consult practitioners with an illness because their agency has been significantly compromised – they are unable to act in ways they ordinarily take for granted. $F_{\text{glob}}$ must therefore be derived from a more inclusive concept of function that describes not just what this particular individual can do, but what they should be able to do, i.e., that defines the context that makes $F_{\text{glob}}$ (of the individual) medically/osteopathically significant. I denote this more inclusive concept by the term $F_{\text{pr}}$ to indicate what patients and practitioners just assume to be normal for people in general. I do not have space within this thesis to explore fully what is meant by $F_{\text{pr}}$ or how the perception is generated. It is enough for my analysis to know that it lurks in the background informing both patients and practitioners what agency is and the actions patients take for granted (because "That's what everybody does.", "I've always been able to do it.", "I always find that ..." or "You can expect that at your age.").

"Greater capacity" is defined differently for biologists, practitioners and patients. Although it might be assumed that these groups share the same interests, closer examination shows that important differences exist, derived from different interests.

6.1.2. The different interests of biologists and practitioners

Biologists' interest in function is different from that of practitioners. Biologists are primarily interested in extending knowledge, practitioners in applying it to heal.
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Importantly, biologists are not especially interested in dysfunction whereas practitioners are. On Cummins’s analysis biological interest is primarily at the level of dispositions through the application of Instantiation Strategies. Practitioners on the other hand need to understand how dispositions operate together in true systems in the context of whole organisms, because it is whole organisms that are ill.

The focus of interest for biologists is different from that of practitioners in the same way that the foci of science and medicine are different. This parallels the debate about whether medicine is a science, where the opposing sides base their arguments either on the purpose of each, or on the knowledge base of each. Munson, for example, argues that medicine is not a science because its practical focus is different from science’s. He contrasts them by defining each one’s principal internal features, which he identifies as:

- their internal aims;
- their internal criteria of success;
- the internal principles regulating the conduct of each discipline’s activities. (Munson, 1981)

Munson’s point is that the basic internal aim of science is “the acquisition of knowledge and understanding of the world and the things that are in it.” While the basic internal aim of medicine is to address the practical problems of disease and illness. Although medicine is also interested in the acquisition of knowledge this is not its primary purpose. In medicine, knowledge is there to inform the therapeutic process, not for its own sake. In addition, scientific knowledge has to be of a particular kind and gained through formalised and approved scientific methods. Science is therefore both a body of knowledge and a method of inquiry. Medicine has its own body of knowledge, of which only parts are scientific. Clinical experience, for example, cannot, because of its individual nature, meet the exacting standards that science requires for valid scientific knowledge, but it is still regarded as an important part of medicine’s body of knowledge and necessary for effective practice.
Biologists want to know which of an item's characteristics is its proper function and which merely fortuitous effects, or adaptations from their original purposes. This is in order to develop biology's body of knowledge beneath the unified theory umbrella of evolution based on natural selection. It is important for biologists to know that turtles' forelimbs first developed as paddles to swim with and only later adapted into trowels; or that penguins' flippers are adapted wings. It is only from knowledge of those things that it is possible to piece together a coherent picture of how sea creatures that also live on land relate to each other in evolutionary terms.

Practitioners are only interested in this kind of information if it informs decisions that have a direct bearing on diagnosing and treating illness. Whether the ear started out as a hearing device or something to support hats is only of interest if it explains an individual patient's illness. In fact more could be said on this, for my analysis of the Case Studies suggested that, explicitly for the osteopath and implicitly for the orthopaedic surgeons, practitioners' interest in function is to explain the particular illness experience of a patient. Clearly, then, the interest in function for biologists and practitioners is different and I concur with Preston when she argues that a Cummins-type analysis based on systems provides one kind of explanation and that analysis based on proper function provides another. (Preston, 1998) My claim is that a Cummins-type analysis that focuses on the present functions of items is more appropriate for health practice while the concept of proper function serves biological interests.

Clearly there are differences in the way function is conceptualised and, more significantly, applied in biology and medicine. Biological function continues to be of interest to practitioners for developing its theoretical base. My argument, developed from Cummins, is that while this information operates at the level of dispositions, true function, and the real interest of practitioners (not theoreticians) operates at the level of systems which it is the practitioner's task to describe and define.
6.1.3. The different interests of practitioners and patients

It might (wrongly) be assumed that because patients and practitioners are both working to improve patients' health they therefore have the same interests. Although there are some shared interests, such as removing pain or disability, these represent different kinds of interests. As the Patient Study demonstrated, patients' interests are focused on activities in the world, such as being able to pick up a young child, while practitioners' interests are in explaining the illness in biological (and other) terms. Things like pain and disability are viewed, in the one case, as interfering with life activities and, in the other, as some kind of biological failure.

The way that function explains problems of human living is likely to be different from the way it is formulated to explain biological failure and echoes the accounts of illness as a biological problem vs. a problem of human living (5.2.1, and 5.2.2). Primary care practitioners have the difficult job of bringing these two areas of interest together. What makes this particularly difficult is the fact that the distinction goes largely unrecognised. At the heart of the problem is a failure to distinguish between the significance (for patients) of an action and the significance (for practitioners) of the part that is performing the action. Here Cummins's distinction between function and disposition is helpful. A person's capacity to perform certain actions (and thereby fulfil goals) is (logically) independent both of the dispositions required to achieve them — they could be achieved by other items with similar dispositions — and the purpose they are fulfilling — the person simply might not have those goals and therefore might not be aware that they have lost certain capacities. If the dispositions necessary for hip function fail due to degeneration, they can be replaced by artificial parts that provide equivalent dispositions and therefore the capacity necessary to enable the hip to function satisfactorily. But if the person doesn't use their hip because they sit around all day (and assuming there is no pain), they have no need of those capacities and may not consult their doctor, i.e., do not consider themselves to be ill. This conclusion is supported by Thompson's studies of the elderly
(4.1.1.1) – that even when pathology is present, the key factor for practitioners is maintaining “functional ability”.

What makes an act a function is independent, therefore, of the dispositions that provide the capacity to perform the act. Hence, the concerns of practitioners about the normal behaviour of parts doesn’t necessarily match the needs of the patient – though in practice it will usually be the same.

6.2. Patients and their parts

Patients have various capacities that together are necessary for full healthy function. The next question is how these capacities operate together and how they are to be understood in the context of the fully functioning person.

6.2.1. Adaptation and functional capacity

A central concept in both osteopathy and (perhaps less explicitly) conventional medicine is that of adaptation. This is the view that body parts are able to adapt their function, i.e., refocus their capacities, in order to achieve particular goals. These are not always predictable and are often judged to be the cause of dysfunction, particularly by osteopaths. It means that an item’s capacity is not identical with its function. At different times the same capacity can be used for different functions. The person with a painful leg may use their arms to support their weight as they move about. This is not the usual ‘function’ of arms, but it enables the person to achieve their goals and to function in a social capacity. On both a BST and proper function analysis arms adapting in this way would be dysfunctions and therefore diseased, because that is not what they usually do, nor does it explain their present existence. But what is the “proper function” of arms? Historically we have not used arms to drive cars or operate keyboards, but clearly we expect them to do those kinds of things. Presumably, the defence is that arms have
evolved to do any number of different things, but this leaves the problem of how we can know the limits to those abilities and therefore what is a legitimate claim to be ill.\textsuperscript{72} Someone may be able to walk on their hands for a few metres, but no practitioner would take their complaint not to be able to walk for more than a mile seriously.

All this adds further weight to the idea that function is not defined by specific capacities, but by the ability to achieve particular ends. On one hand there are the various capacities an organism has and on the other, the ends to which they are put. For the most part, in any particular species, there is correlation between capacity and use; but the ability to adapt and compensate in order to achieve goals that are important to the organism makes explicit the fact that it is more important to the organism that it achieves its goals than that it maintains its capacities. Some capacities can't easily be compensated for. If the heart fails, the capacity that the heart contributes to the body system can't be taken up by the adaptation of another body part. The emphasis by conventional medicine on the capacity of essential organs such as the heart has meant that the relationship between capacity and function has been assumed to be causal, when, as Cummins points out, it isn't. My argument is that function describes a different kind of relationship, i.e., not a causal one, though just what that is requires further analysis.

For the moment then, the ability of some body parts to adapt, that is, to apply their capacity to different ends, indicates that there is no logical causal relationship between capacity and function. What that means for statements such as 'the function of the heart is to pump blood', is still unclear. To begin to understand it in more detail I will examine the function of artefacts to see what parallels there are between artefact function and the ability of organisms to function.

\textsuperscript{72} This has particular relevance for 'industrial' or 'occupational' injuries, such as Repetitive Strain Injury (RSI). If it is not the normal function of the hand/wrist to operate keyboards why is it an illness when that 'function' fails?
6.2.2. **Function of artefacts: parallels with patient's interests**

The notion of purpose is perhaps more easily defined for artefacts than for biological items. When a designer or craftsman sets out to make an artefact he usually has an end in mind. It might not be a carefully thought out end, he might just be whittling away at a piece of wood, seeing what happens when he puts a number of things together, or noticing an unexpected effect when mixing two chemicals and then using them as the basis of some other item. I will suggest that 'the end in mind' generally belongs to one of three categories that exist along a sliding scale: 1. Artefacts, such as chairs and can-openers, that are made to operate in a particular context; this entails being part of some larger item or system that completes the context. 2. Artefacts that are made primarily for their own sakes, such as pictures and sculptures; once they are completed, the artists' purposes in making them have been achieved, but they may go on to be utilised by the artist, or other people, in a variety of ways. 3. Artefacts that have a specific capacity but which are, in a sense, incomplete; these items are made with a broad general purpose in mind, rather than a specific one; examples are paper, nails, string or planks of wood. I will focus specifically on the first and third of these as *prima facie* they parallel the biological focus on proper function and the organism's on being able to adapt to different ends.

### 6.2.2.1 Artefacts with intended functions

It is easier to ascribe functions to things like chairs and can-openers than it is to things like pictures, gardens or planks. Deviant cases (apart from failed function, malfunction and non-function) are those situations where something designed with one function is actually used for something else. The fire-extinguisher holding the fire door open or the chair leg being used in the garden as a dibble are examples of what Achinstein calls 'use functions'. (Achinstein, 1977) The issue in artefacts is how intention, and hence purpose, links with the capacity of the item as function.

When a designer/craftsman makes a table or chair, he doesn't make any old table or chair, he makes a particular table or chair. What makes a particular table particular is the
way in which the designer/craftsman adapts the basic elements of table-ness with the specific context in which the table will be used. So tables generally have a number of legs (or equivalent) which support a flat top. There are a variety of kinds of table depending on the use to which it will be put. The dining table, for example, is designed to have place-settings and food placed on it and for people to sit around it to eat together. By intending it to be used for a particular purpose, the designer/craftsman ascribes a particular function to the table. The table has a function because there is a context, which, if it is actually used there, fulfils the purpose. The purpose of the table is not just to be a beautiful item, admired for its own sake, though it could be made for that purpose. (Then it would be a piece of art rather than a functional table.) In designing and making the dining table, the designer/craftsman must ensure that the table's capacity enables it to achieve the required purpose. A coffee table cannot easily be utilised as a board-room table for example, even though they share many common properties associated with 'tables'. Dining tables, coffee tables, computer tables and folding tables each have their functions ascribed from the context in which they are intended to operate. Any particular table, a dining table say, entails matching capacity to purpose and if they match it can be said to function well. But what if they are not used for the purpose or in the context for which they were designed, do they then not have a function?

My dining table hasn't been used to put place-settings or food on for several months. At the moment it is covered in books and papers, but that doesn't mean that its purpose and original function has changed. It is still a dining table and its purpose/function is still to sit at to eat – who knows, one day it may even return to be used as a dining table. My table's function will always be the one usually associated with dining tables because its function, to eat at, was the reason it was made. If no-one ever eats from it again and the pile of books on it increases so much that it collapses, it would still be the case that its function is (or was, if it breaks and is unusable) to be a table. Even if it was transported to
another world where there was no food as we know it and where, therefore, there were no dining tables, it would still be the case that the function of this particular table is to put place-settings and food on and to eat at.73

The reason for my making the strong claim that intentions are implicit in the item is because the intentions of the designer/craftsman are implied by the existence of the dining table. When the designer and, if different, the craftsman ‘intended’ the table they did so as agents, that is, they acted (in designing and crafting) with intent. From this it follows that their agency and intention is manifest in the table. Assuming that the craftsmanship is good, we can infer what their intentions were (which is also their agency) because those intentions are manifest in the table we have in front of us. To see what the makers’ intentions were, we have only to look at the table. Of course, we make an assumption here which is that this table is similar to all the other tables we have known, that this table does actually manifest the intentions we normally associate with tables both generally – supporting legs and a flat top – and specifically as a dining table, say. If the thing from another world without food that looks exactly like a table but which was made with a quite different intention was examined, then our assumption that it is a table because that is what things that have legs and a flat top are, would be wrong.

The existence of the table, therefore, is explained by its intended purpose (which is brought about through the agency of the designer/craftsman). Once that intention is manifest in the production of an actual table, it can’t be removed as long as the table continues to exist. To see the table is to see the agent’s intention. In this case, purpose, function and goal-directed behaviour all refer to the same thing, a (particular) dining table. If there had been no agent and no intention, there wouldn’t be a table – though

73 It would be possible, of course, to have something in this different world that looked exactly like what we know as a table, but which was made with quite different intentions in mind. In this case it would not have the function of being sat at to eat from. This of course is cont ...

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there could be an item with four legs and a flat top. Artefacts designed and made for a purpose, i.e., with a function, manifest the intentions of the agent that created it.

The link between intention and actual use is an important one for artefact design. If I buy a coffee table and try to use it as a dining table it will fail. This is because it was never intended for that purpose. A small car that is used to tow a heavy caravan will probably break down because it was never intended to pull that kind of weight. If I then complain that it has failed, the salesman will tell me that I shouldn't have used it to tow; it has only failed to do something it was never intended to do. To assess the success of function requires knowledge of the design criteria. Here, appearances may be deceptive; an electric tool, for example, may be made with a limited life-span. When it fails after so many hours use it is not really failing, but functioning according to the designer's intentions. On the other hand, the designer may simply have specified the wrong components. His intention was that the tool should function for 500 hours, but one part weakened and broke after 200 hours use. So although the designer's intentions appear to be implicit within an artefact, without recourse to the design, it may not be possible to know for certain what the intention is.

This is the concept of function that theorists such as Millikan have in mind when trying to ascribe proper functions to biological items. They want to be able to say with certainty that a trait has a particular function that is the equivalent of an implicit intention that remains true whether or not it actually is being used for, or actually achieves that purpose. The issue here is whether there is a substitute for 'intention' that carries the same force but without the same psychological and theological implications. When we look at the heart it looks to us as if it is a pump made with the intention of circulating blood. If we can justify ascribing intentions to biological items, there appears to be a

Millikan's point in arguing that having the mark or form of function is not the same as having a proper function.
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strong equivalence between ascribing functions to artefacts made with a specific intention and to biological items such as hearts, livers and pain avoidance behaviour.

Despite this strong equivalence, I will be arguing that ascribing functions to biological items in the same way that we ascribe functions to artefacts is in fact wrong. Biological items do not have functions in the way that tables and can-openers have functions. My point will be that biological items enter into functional relationships. The fact that certain capacities – the capacity of the heart to pump blood for example – are essential for the organism to achieve its goals is contingent in the same way (using Cummins’s example) that the gnomon of the sundial is contingent on its usefulness as a timepiece even though it was never intended for that purpose.

6.2.2.2 Artefacts made for an undefined purpose

Things like tables and can-openers are not the only kinds of artefact. A whole range of items are made with a specific capacity but with potential, rather than actual, functions. A plank of wood can be used as a scaffold board, a book shelf or a bridge, among a range of things. We don’t usually ascribe functions to things like planks of wood, wheels or pieces of paper, not, that is, until we actually use them for something or incorporate them into some larger item such as the hull of a boat, a cart, or a page in a book.

It’s fairly straightforward to say what makes an item such as a plank, with no particular function, into an item with a function. Once the range of potential functions becomes an actual function, i.e., it is used for a particular purpose, the plank has a function. So the scaffolding plank, although it is no more than a strong plank with some metal edging, has a function because it has a goal. The plank in the hull of a wooden ship has a function as does the plank incorporated into a garden shed.

What this makes clear, and which wasn’t clear from looking at artefacts with specific functions such as tables, is the distinction and non-dependence between, capacity and goal. A builder who intends to build a shed selects some wood because it has the right capacity to achieve his goal, but the capacity does not compel him to make the shed any
more than his intention to build the shed compels him to select any particular piece of wood – any other item with the same capacity could do as well. What is important is that all the parts of the system 'shed' relate to each other in such a way that they achieve the greater capacity, that of being a shed.

A plank of wood may have a capacity that is necessary to make a shed, but it only has a function when it is arranged in a particular way. To make a shed also needs other pieces of wood with different capacities, plus nails, screws, windows and so on. The shed is a system in which any one piece has significance only because of its place within it.

We have here a further example of Cummins's distinction between dispositions and functions. Planks, hoses and screws have dispositions; they only take on functions when they are arranged together with other dispositions in such a way that they generate a greater capacity.

My analysis so far supports further the idea that there are (at least) two processes occurring. Artefacts with a specific, designed purpose and artefacts with capacity but no specific purpose. There is one important final point to make before examining to what extent this distinction applies also to biological items. Function in artefacts refers to particular rather than general examples. It is not possible to say what the function of tables in general is; trying to do so involves giving specific examples – dining, coffee or computer tables, for example. Even things like cups and pens can depend on what kind of cup or pen. The question to further clarify is what makes particular examples, particular.

### 6.2.2.3 Parallels between artefact and biological function

How are biological items ascribed functions, and how, if at all, do these differ from artefact function ascriptions? A key issue, as I've pointed out, is one of intent. We know, or assume, that the designer/craftsman of an artefact had some purpose in mind when creating it. But even if there is a creative power behind biological items, we couldn't know for certain what the proper function of it is any more than we can know whether an
electric tool has failed because it was meant to fail or because it had a faulty component. In biology we would still have to find some rationale for ascribing function to particular traits.

My analysis of how practitioners work and the conceptual foundations of practice theory suggests that at least two processes are operating: 1 a focus on the proper function of particular traits; and 2 a focus on the overall activities of the person. If a person is merely a machine, this equates to the capacity of individual parts of the machine and the greater capacity of the machine itself – what it was designed and intended to do. I also argued that the concept of illness describes the experience of the person as a whole while disease tends to describe partial abnormalities. My brief examination of function ascriptions in artefacts suggests at least two ways in which function is ascribed to artefacts; items made with a specific function, and items made with a particular capacity but which are required to be put to some use before they can be said to function. The question now is whether these two sets describe parallel processes in which the theoretical explanation of one applies equally to the other.

Biological traits don't obviously have intended functions in the way that artefacts do. Even if the notion of proper function can be defended, discovering what it is for any biological trait is similar to the way that the function of an artefact might be deduced when the intentions of the designer/craftsman are not known. Because artefact function presupposes that intent precedes the item, an unknown artefact can be examined with the reasonable expectation that it can be explained. If an American spy plane crashes in China, the Chinese might examine it in an attempt to work out what various of the internal parts do and how they do it. Even if a totally new design has been incorporated into some part of the plane, it should be possible for a person familiar with the technology to work out what it does. Small component parts that are familiar would be identified and from knowledge of their properties and/or functions, together with the context in which they are found, an informed guess could be made as to what the function of the whole item is. This analysis depends on two important assumptions; first that American
technology is basically the same as Chinese, and second, that the item was actually made with intent, implying the action of an agent, and not just at someone's whim. These assumptions form the basis of the kind of analysis used in archaeology when an unfamiliar artefact is discovered. Inductive reasoning depends on familiarity with similar items in order to come to a theory about what this unfamiliar item is.

Two components are at work here, analogy and context. Anyone examining the plane with a good knowledge of similar items and knowing broadly what planes do could make an educated guess at explaining it. But if analogy and context are removed, the problem is much more difficult. Imagine if, instead of a reasonably familiar item being discovered, something totally unfamiliar was found. Suppose a small portable computer was sent back in time to the Middle Ages; would people then have been able to work out what its function is from analysing it? Because they had no knowledge of electronics or the technology that goes to make even a simple (by today's standard) computer, they couldn't work out its function, even in principle. They would have no knowledge of the context in which computers operate nor would they be familiar with any of the technology. Without knowledge of electricity it is hard to see how even the cleverest person then could begin to hazard a close guess at what the computer was or did. Even in the unlikely event that someone did guess correctly what it was, the guess would have no validity because it had neither rational basis nor empirical evidence to support it as the correct guess. If someone did ascribe a function to it, it would most probably be in terms of something they were familiar with, a Monarch's ceremonial stool, perhaps.

The way that we attempt to understand biological function, I suggest, broadly follows a similar analytical process to the one non-technological cultures might adopt in their analysis of modern electronics, and this for two reasons. The first, because it is natural to assume intentional design; the living natural world looks to us as if it is designed, it has many of the hallmarks of design including a sense of purpose, symmetry, reproducibility and integration, it's just that we can't be sure what the design should be; in addition there is resistance to intuiting an agent behind the intention. Despite these reservations, the
ways in which we analyse biological items are similar to the ways in which we analyse artefacts whose design we don’t know but assume.

It is actually very difficult for us to be clear here about how we do understand biology. We have a heritage of assuming that there is (Divine) intent behind biological items. Even though, as I’ve pointed out, some of the early proponents of evolutionary theory claimed that it overthrew creationism, the idea that nature has a purpose is deeply ingrained in the human perception of the world. This assumption, whether it is right or wrong, continues to inform our understanding of biology. The point that I made earlier was that even if there is an agent at work and Divine intent behind the biological world, we can’t be sure what that intention is. We might be like someone in the Middle Ages trying to understand a computer by interpreting it against a knowledge of artefacts in the Middle Ages.74 Because there is evidence of adaptation, and for us adaptation is indicative of purposive behaviour, we assume that there is something equivalent to intent occurring in biology. As we have seen in the analysis of Proper Function, natural selection is widely assumed to have this rôle of providing intent in biological function ascriptions. The problem is that we can’t test the theory against anything. Like an archaeologist, we use analogy to surmise what the functions of various things are – bones are levers, the heart is a pump, joints are pivots with axes of rotation and so on.

The second similarity biology has with someone trying to understand the function of something completely outside their experience concerns the ‘wholeness’ of biological items. One of the reasons a person from the Middle Ages would be unable to understand

74 There are indications that this is in fact what happens. Our attempts to understand the human brain and nervous system for example, have been strongly influenced by the current innovative technology. The invention of the telephone led to the analogy of nerves as wires and synapses as switches; when the computer came along, this analogy became more sophisticated and incorporated concepts of hardware and software, nerves and programmes of behaviour. More recently cybernetics, networking, fuzzy logic and similar advanced computer concepts have led to a further reinterpretation of the workings of the human nervous system. The fact is that we have no standard against which to test our theories, other than those we make ourselves.
what a computer is, relates to the way it is assembled. Examining the internal circuitry wouldn’t reveal what each part contributes to the whole. To the uninformed observer it is no more than a collection of bits of metal and plastic. But neither is it possible, even in principle, to separate out the various elements that constitute a complex animal such as a human being, or to say with certainty what each part contributes to the whole. In dissecting out one structure several others are destroyed. It might be possible to isolate individual cells, but they wouldn’t provide meaningful knowledge of the structure of the organism. There are only a limited number of different types of cell in the body. Organs and tissues are made up of these cells organised in different and significant arrangements, and at times these adapt to perform functions normally performed by different tissues. Because of the growth and development process based on differentiated cells, the demarcation of many structures is arbitrary. In muscle for example, muscle cells, tendons and the tendon’s attachment to bone, form a gradation of tissue with no clear distinction between structures; tendon collagen mixes with the collagen in bone and muscles attach to fascia in such a way that even under a microscope it is impossible to say where one ends and other begins. Named ligaments can just be thickenings in fascia or connective tissue sheets. Much of the anatomical categorisation is nominal, based on convention and the need for communication between professionals. It is only in the context of the whole that individual parts can be explained and this depends on an understanding of the capacity of the whole organism.

All this reinforces the point that function cannot be discovered from examining the item alone. Aetioligists, like Millikan, define function from past experience, but this brings with it a sense that some traits have functions (and others not) due to some mysterious element of functionality inherent within the item. My point is that functionality describes a particular kind of relationship that is context dependent, a different order of

This of course is true for someone today who, although familiar with what computers do cont ...
organisation, to use Angyal’s terminology. We can’t, even in principle, know what the function of a trait is from examination alone. A thought experiment may explain this further.

Travelling in the South American rain forests I come across a small animal that I don’t recognise. It turns out to be a previously undiscovered creature. It has a body, legs and a head with what appear to be two eyes, ears and a mouth. The odd thing is that it has a reddish circular patch on its forehead. Examination reveals that the centre of the patch is warmer than the rest of the skin and is surrounded by an extensive nerve supply. The nerve supply is traced to the cerebral cortex and is found to be sensitive to the infra-red end of the electro-magnetic spectrum. Can I at this point say what the function of the patch is? It might seem to me that it is to detect heat; that it is an infra-red third eye – to see at night perhaps. But how do I come to make that hypothesis, is it made from observation alone? Clearly it isn’t; I draw analogies with other animals in order to come to this understanding. Although I might never have come across anything quite like this patch, I know what the functions of nerves, receptors and the cerebral cortex are and that an extensive nerve supply usually means hypersensitivity of some kind. The fact that the patch is warm suggests that it is suffused with blood and that possibly the nerve network is a heat detector that enables the creature to move about in the dark. All in all a quite rational and reasonable explanation – but wrong.

Over time the animal is examined and it is discovered that it always sleeps at night; its whole metabolism slows down if light is removed, and in fact the patch doesn’t appear to have any purpose. At this point the temptation might be to say that it has lost its original function, perhaps it once lived in an environment where it actually was nocturnal, but since changing its behaviour, the patch has become redundant. Again I would be wrong.

and can use one expertly, has no idea how the internal parts contribute to its capabilities.
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On a return visit to the area, some more examples of the creature are discovered and their behaviour is examined. It is found that during courtship, the blood flow to the patch increases, raising its temperature; the warmth is detected by the patch of another animal and leads to mating.

This further supports the argument that our knowledge of function comes from two main sources, analogy and context. I used analogy to surmise what the function of the patch was, but it was only seeing it acting in context that completed the picture. This is why Middle Ages society could not detect what the function of a computer is; there would be nothing in their experience with which they could draw an analogy and they wouldn’t be able to see it operating in context.

If it is not possible, even in principle, to know what an item’s function is other than from the context in which it operates, it follows that function ascriptions do not apply so much to an item as to the relationship the item has with other items. Martin Rudwick makes this explicit in his analysis of function ascriptions in fossils. (Rudwick, 1998) He argues that

Anatomically (a fossil organism) may be more or less complete, but it is isolated from most features of its original environment, and of course it lacks the ongoing activities of life. The function – if any – of its various parts and organs therefore cannot be determined by simple observation and experiment; we cannot (as we can, in principle, with any living organism) simply observe what effects an organ in fact achieves in natural or experimentally contrived situations. (p.105)

This correlates with Cummins’s analysis in which the function of an item derives from its place in a system rather than from any inherent property. Without knowledge of the system and its capacity there is no knowledge of the function of a part.

How, then, does this relate to my earlier analysis of artefact function? Chairs, can openers and running for a bus have functions because they form a system related to sitting, opening a can and catching a bus, each of which entails additional items – cans, a person wanting to sit and a bus. Other items with specific capacities only have a function when
they form a system. The plank has yet to be a component in the shed, and the screw to be put into the wall to hold a bracket, for example. I then suggested that because of the way in which we assume intention about the manufacture of artefacts and from prior knowledge of the dispositions and capacities of constituent parts that make up items, unfamiliar artefacts can be analysed and understood even when the intention of the designer is unknown. I suggested that this is analogous with the way in which we try to understand nature in that it entails distinguishing between the dispositions and the capacity of systems.

Rudwick makes a similar point in relation to inferring the function of fossil parts; he argues that the inference is drawn not so much from homological or analogical comparisons but "on applying a criterion of mechanical fitness." (the author's emphasis) Because, with fossils, it is possible that there once were functions (and structures) that have no direct correlates today, palaeontologists base their inferences on their "understanding of the problems of engineering." (p.107) By working out what the item would have been physically capable of, and from the knowledge we have of the conditions and context of the time, we infer function. I agree with Rudwick that this relies on analogy with mechanical things and on prior knowledge of basic engineering principles. The points I draw from Rudwick are 1. that function cannot be inferred from structure alone; and 2. that function ascriptions depend on some intuition of what end a capacity can achieve. But even these do not provide conclusive proof of function in biological traits and I am not yet prepared to concede that functions exist in biological items as real events.

So far in this section I have focused on similarities between biological proper function and artefacts with intended purposes, but there is also a correlation between biological function and artefacts with potential functions. It is unclear, particularly in osteopathy, to what statements about the function of, say, muscle refer. It can mean the function of muscle in general, such as, 'the function of muscle is to contract, or to tension the structures to which it is attached'. But muscle doesn't have a function in the same way
that the heart has a function; it has a function in the more general, though restricted sense, that screws, say, have a function, which is to hold two pieces of solid material together. But different screws in different situations can have different specific functions. The same is true of muscles. The function of gluteus maximus is different from the function of supraspinatus for example. Although they are both made up of striated muscle and in general do the same kind of thing in terms of the system to which they belong – they tension and approximate the structures to which they attach – the capacities of the two systems are different.

So how is this different from the situation with hearts. The heart is muscle, smooth rather than skeletal muscle, of which there are other examples in the body; arteries and the large intestine are smooth muscle structures that function in different capacities. This doesn't cause any difficulties with ascribing function to the heart, but it does with ascribing functions to supraspinatus and gluteus maximus. Skeletal muscles are different from other body structures in one significant way, they relate to the rest of the body (and the external environment) in a number of different capacities. By relates to, I mean forms systems with specific capacities.

The heart functions in the system ‘pumping blood’ with one capacity, the pumping of blood. It can do this quickly or slowly but the essential capacity of the system doesn’t change. This is different from most skeletal muscle, where, for example, gluteus maximus can function in more than one way. To quote from Gray’s Anatomy for example,

When the gluteus maximus acts from the pelvis, it can extend the flexed thigh and bring it into line with the trunk. Taking its fixed point below, it may prevent the forward momentum of the trunk from causing flexion at the supporting hip during bipedal gait. In standing the muscle is inactive and remains so in forward swaying at the ankle joints or during bending forwards at the hip joints to touch the toes. However, in conjunction with the hamstrings, it is active in raising the trunk, after stooping, by rotating the pelvis backwards on the head of the femur. It is active intermittently in the walking cycle and climbing upstairs, and continuously active in strong lateral rotation of the thigh. Its upper fibres are active in powerful abduction of the thigh. It is a tensor of the fascia lata and
through the ilio-tibial tract it steadies the femur on the tibia, when the knee extensor muscles are relaxed. (Warwick & Williams, 1973 p.567)

In other words, gluteus maximus functions in a number of different capacities depending on the actions of the person. It is used in conjunction with different muscles in standing, walking, climbing, stamping, digging, sitting down and so on. In unusual situations it may be called upon to compensate for deficiencies in other parts of the body. I recall a patient with congenital absence of gluteus medius who had a Trendelenburg Gait. This necessitated lateral deviation of the pelvis and abduction of the thigh during walking in order to allow flexion of the thigh – brought about, in part, by gluteus maximus acting in an additional compensatory capacity.

Muscles then seem to be more like screws than chairs in that their usual ways of working entail a number of different functions depending on the capacity that is required. The focus of interest now is not upon what each muscle does but on the way groups of muscles act together to enable a person to walk, run, sit, stand, play tennis or ride a bicycle. In fact, even the simplest of movements entail activities in a large number of different muscles. If I stand still and reach to pick up a glass of water from the table in front of me, my brain sends messages to contract my elbow extensors and shoulder flexors, but the movement also requires relaxation of the antagonists, together with muscular activity to rotate my scapula and, at the appropriate time to stiffen my wrist, extend and then flex fingers to grasp the glass and finally the reverse of the elbow and shoulder movements to bring the glass towards me. On top of all this there will be necessary adjustments through my spinal musculature and legs in order to compensate for the change in weight bearing brought about by the repositioning of my arm and the weight of the glass. This description doesn’t take account of the integrated activity of the nervous system and spinal reflexes that controls the movement, including information from joint receptors, muscle spindles, eyes, and changes in blood supply to ensure that muscles receive an appropriate amount of oxygen and nutrition. If any part of this goes wrong, a muscle fails to contract, a nerve sends the wrong message or a joint fails to move, I will experience a loss of capacity, and this may make me believe that I am ill.
6.3. Return to the work of function concepts in illness and disease

I argued in Chapter 2 that function ascriptions provide the foundation for concepts of disease and illness. Disease descriptions are based on the assumption that body parts have specific functions ($F_{dis}$) which, if they fail, lead to dysfunction, and are linked to specific clinical signs and an aetiological agent. Illness, as the experience that motivates a person to seek health care, relies on a broader concept of function ($F_{ill}$), a loss of capacity which prevents the person from doing things that they normally take for granted.

I also argued that $F_{dis}$ is based on $F_{phys}/F_{biol}$ because knowledge of the proper function of body parts is assumed to be the same as knowledge of physiology. Without knowledge of biological function there is no referential standard to know when a part is dysfunctioning. I inferred that $F_{ill}$, although not directly equivalent, was based on $F_{glob}$, the (dys)functional capacity of a person, i.e., their inability to do all the things normally associated with human life, including striving for personal goals.

My analysis of biological function identified two particular theoretical accounts, one focusing on $F_{biol}$ as the proper function of body parts, and the other on $F_{glob}$ as the greater capacity of a person. The problem for the neat correlation of $F_{biol}$ with disease and $F_{glob}$ with illness is that my examination of the philosophical arguments for $F_{biol}$ leads me to conclude that its foundations are not as secure as such a correlation requires. This leaves the serious epistemological problem of knowing what an item's proper function is (or should be). A Cummins-style analysis of $F_{glob}$ appears to correlate with illness, but doesn't (nor does it claim to) provide a scientific account of function. On Cummins's account $F_{glob}$ is the greater capacity of a person made up of lesser capacities as organised (functional) systems of dispositions. But if Cummins's account is taken as a basis for practice, there is the ontological problem of knowing which systems are true functions, i.e., knowing how the multitudinous dispositions of the body are to be conceptually organised into lesser capacities in the context of the greater capacity of the person.
A further problem is that my examination of clinical practice suggested that practitioners, particularly those involved in secondary care, rely on a concept of function based on or akin to $F_{biol}$ to judge whether or not a part is functioning normally. It is important for conventional medicine's claim to be scientific to know that function is a proper scientific concept. We appear to have a strong but unfocused concept to explain the broader concerns of patients in terms of loss of capacity, and a clearly focused but philosophically flimsy basis for explaining disease. Before suggesting ways these problems might be resolved (in Chapter 7), it may be helpful to clarify what are the important conclusions I have drawn so far about function.

6.4. Return to the work of function concepts in practice

My main analysis of function concepts in practice will be described in Chapter 7; for now I wish to summarise the main issues that have emerged from the philosophical work as they relate to practice.

6.4.1. Function as a relational concept

The first conclusion is that function is a relational concept; that is, it describes the relationship that exists between a trait and some other part of the organism or with the organism itself. This is true both of proper function, where the relationship is between the item and its local tissues, and global function, the ability of a person to function in a given social and environmental context. Because function is relational, items do not have functions in the way that they have properties. Furthermore, it is not possible, even in principle, to know what the function of an item is from examination of the item alone; the context and the purpose achieved must either be assumed or observed.

Describing the function of the heart describes a particular relationship it has with the rest of the body – it circulates blood to it. Without that relationship, the heart is merely a muscle that is disposed to have a particular kind of action due to its structure. On Cummins's account the relationship is of a particular kind – not a simple relation (to use Angyal's distinction) but an organised system where a component has value due not to an

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inherent property, but its position within the system. The importance of position becomes more explicit in the case of muscles. Skeletal muscle tissue is broadly the same throughout the body (allowing for differences in red and white muscle), but the function of any particular muscle depends on the arrangement of fibres in the muscle and of the muscle in relation to contiguous structures. So gluteus maximus’s function is defined by the way the fibres are arranged within the muscle and the way the muscle is attached to the pelvis, femur and surrounding connective tissue. It is the fact of this organisation in function that allows adaptation by the body, as previously described, as well as surgical techniques where one part of the body is moved to another area, e.g., veins from the leg used to replace blocked heart vessels. In practice knowing the “proper” function of a particular muscle is insignificant, what is significant is what function a part actually is performing, or how it can be adapted to a new function.

Because function describes the relationship between items, it is a mistake to try to justify particular traits/properties/dispositions as the item’s proper function. Even on the simple function formula, the function of $x$ is to do $y$, function is defined by the doing of $y$, not on any inherent property of $x$. Function therefore, defines the relationship an item has with other items in terms of a global outcome – what Cummins terms “the greater capacity”. Function describes the relationship between a capacity (constituted by those dispositions on which the capacity is ontologically dependent) and a greater capacity (which can be the organism) to which it contributes. The function relationship is therefore defined by the greater capacity, the capacity is not defined by the relationship.

This is the difference between cause and function, both of which describe relationships. A causal relationship, “contraction of the heart muscle causes blood to be circulated around the body”, gives no indication of how the outcome of the relationship is beneficial to the body. On a more logical point, the outcome (and significance of cause as a relationship), the circulation of blood, is contingent on a particular property of the heart. Given the facts of the situation, if the heart contracts blood will necessarily be (caused to be) circulated (assuming a complete structure). A functional relationship, “the function of the heart is to...
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"pump blood around the body", describes the actions of the heart in terms of the relationship that the heart (with its properties) has with the rest of the body, i.e., in producing a required outcome. That outcome *necessarily* requires the heart to pump in this way (or some equivalent capacity). This is why function ascriptions can never be reduced to aetiological descriptions of cause. The fact that the heart occupies space in the thoracic cavity describes a causal relationship it has with the thorax, but describing causal relationships alone will not tell us which relationships the heart has with the thorax are important for the organism, which is key for practitioners' understanding of the heart. If I want to know whether it is important that the heart is where it is in the thoracic cavity, I need to know its function not merely the (caused) effects of its properties.

### 6.4.2. The significance of context and loss of agency

If function is a relational concept, it must also be contextual. A part can only form a relationship (and have a function) in a specified context. On a Cummins-style analysis function defines the capacity of a system (which can be an organism). Cummins doesn't specify where the hierarchy of systems ends, which is both a strength and weakness of his account. It is natural to talk about hearts and cardio-vascular systems having functions, but not a person, though a person may perform a function as receptionist, say. But the business she works for may perform a function providing information for a government department which in turn performs a function in governing a community and so on. At each stage of the hierarchy the new capacity only has a function in a new larger context as it contributes to some greater capacity. But also at each stage function is defined in terms of the final greater capacity. Function ascriptions cease when the capacity is an end in itself – a piece of art for example – rather than a component of some greater capacity.

I have argued that the ability of a person to function in a number of contexts, e.g., a doctor, mother, wife, gardener, etc., equates to her ability to be an agent, i.e., the ability to engage with the environment in ways she takes for granted. But what is taken for granted is further defined by the context in which a person is acting. I take it for granted that if I
run for a bus, I will get breathless, but not if I just walk upstairs. In asking about a problem, the practitioner will ask what the symptoms are like in different contexts: whether it hurts getting up from sitting, in the morning, coughing and so on. No item has a function in isolation – all functions are in relation to something which provides the context for evaluating the function. What this means is that the basic function formula, *The function of x is to do y*, is incomplete; it entails context z in which x is functioning. The full formulation is therefore;

(2) *The function of x is to do y in context z.*

Proper function is implicitly context dependent; it is not possible to know which of an item’s traits are functions without knowing the context in which they operate. The context may be historical, on Millikan’s analysis, or a species typical environment, on Boorse’s account. Knowing the context is necessary for defining function, though this is usually implicit and assumed. Descriptive accounts of function all assume a given context. While this may be useful for biological accounts, where contexts need to be standardised, in clinical practice symptoms vary with context (which therefore can’t be assumed). In clinical practice z is explicit because, as I’ve illustrated, practitioners evaluate the functional efficacy of a part in the context in which it operates.

Practice theory here may be different from clinical practice. Theory focuses on normal biological function, and dysfunction is largely defined in terms of function, but clinical work focuses (explicitly in osteopathy and implicitly in conventional medicine) on dysfunction. My analysis so far, suggests not only that there are different concepts of function at work in practice, but also different concepts of dysfunction; further, dysfunction may not be logically related to function, but be a distinct concept. If they are related, it is in terms of some common factor. My argument is that this common factor is the person’s agency, where function facilitates and dysfunction vitiates agency.
6.4.3. **Dysfunction**

The notion of dysfunction is more significant for practice than it is for biology. I argued earlier that biology and medicine are different because their internal aims and measures of success are different. In particular, practitioners (as distinct from biologists and medical theorists) spend most time analysing dysfunction. They want to know whether a patient has dysfunctioning parts and what disease might explain their problem. The way that dysfunction is defined therefore has great significance for practice.

My analysis suggests two important points; that dysfunction is not defined by function alone, and that there are different concepts of dysfunction. The two accounts of function I described suggest different accounts of dysfunction. In one, dysfunction is failed function or malfunction defined by proper function. Here, a hip problem for example, might be discovered from examination of the functional ability of the hip, \( F_{\text{phys}} \), whether or not there is difficulty walking. X-ray of the hip may show loss of cartilage, which together with reduced range of movement, suggests reduced functionality associated with osteoarthritis. \( F_{\text{li}} \) is therefore explained (in part) by \( F_{\text{phys}} \). Screening programmes, with their notion of risk factors, depend on \( F_{\text{phys}} \) rather than \( F_{\text{glob}} \). This concept of dysfunction is largely theoretical and only part of the overall judgement a clinician makes in evaluating a problem and deciding on management. The judgement of whether, for a particular patient, it is dysfunction requires \( F_{\text{glob}} \).

Where function is understood primarily as a global whole-person concept, what counts as dysfunction is defined either by a loss of normal capacity or the introduction of an abnormal capacity, both of which vitiate the person’s ability to perform those activities they normally take for granted. The practitioner may (and probably will) go on to explain that loss of capacity in terms of biological changes, but what drives the explanation is \( F_{\text{glob}} \).

On a Cummins-style analysis, dysfunction is defined by the failure to achieve the capacity necessary to produce some greater capacity, hip function in walking for example, whether due to loss of a necessary capacity, or the presence of a new capacity that vitiates an activity. On this basis, the patient with the pain on walking has their problem explained...
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by looking more broadly at what is entailed by walking for them, that is, the context in which they actually act. Here, walking might be understood (and explained) differently for a shop worker (who stands for long periods) and a keyboard operator (who spends more time sitting) in the context of their total problem.76

Hip pain and difficulty walking might be explained by loss of capacity in the hip itself, degeneration of the hip cartilage for example. But it might also be, as was the case for Mrs A, that other factors, such as a painful knee, contribute to a dysfunctional system. This dysfunctional (dys)capacity might be formed from elements outside the body altogether, a work station that causes strain on a tendon, say. In other words, in the same way that different body parts may adapt their function to ensure that some necessary end is achieved, a dysfunctional system may involve elements that are not normally regarded as parts of a functional system. Dysfunction here is not simply function failure or malfunction, though it may involve them, it describes a (dys)capacity that has harmful or undesirable effects, i.e., it vitiates the person's agency in some way.

Judging what is or is not significant to a problem is different from judging whether something is or isn't the case. Although knowing whether or not a part is functioning normally (based on \( F_{bio} \)) may require a technically complex judgement, it is a simple epistemological judgement – is this normal or abnormal? Practitioners judge whether or not a part is functioning normally by referring to text-book standards which, assuming their testing procedures are good, they can know with some degree of certainty. What they can't know, even in principle, is whether this loss of function is significant, i.e.,

76 A man in his early 70s consulted me a few years ago, complaining of pain in his knee which came on after he had been walking. After going through the usual enquiries about where it hurt and what kind of pain it was, I asked how far he had to have walked before it came on. Expecting the typical kind of reply, such as "after half an hour", I was somewhat surprised when he said, "After I've walked about 16 miles." I was even more surprised when his knee responded to treatment and he was able to continue his fell-walking. Most men of his age would be pleased to be able to walk 16 miles but he took it for granted that he could walk those distances without pain.
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contributing to the illness. An MRI scan may show an intervertebral disc prolapse, but is it causally relevant to the patient’s back pain? Is the patient’s sprained ankle contributing to her headaches? What is the significance for their digestive problem of this patient’s fear of redundancy? These kinds of decisions involve ontological rather than epistemological judgements. What is the stuff of back trouble? What is the stuff of irritable bowel syndrome? Clinical judgements involve more than text books reveal about the nature and aetiology of diseases. Practitioners have to manage a problem not just diagnose it; sometimes the diagnosis indicates the proper course of action in a straightforward way, but more commonly, especially in primary care, knowing what is wrong is only part of knowing how to manage the problem because ‘the problem’ is more than the pathological lesion.

I argued in Chapter 3 that the introduction of the concept of risk factors into practice had altered significantly the rôle of practitioners and their understanding of health and illness. For each patient, the practitioner has to decide not just what the best remedy for a condition might be, but which of all the known risk factors are applicable in this case. In other words the practitioner must assess which dispositions are operating together in a (dys)functional system to produce the (dys)capacity vitiating their agency.

I will return to these themes again in Chapter 7 when I re-examine the various breakdowns of $F_{\text{out}}$ and $F_{\text{med}}$ in the light of the above analysis. There is one further conclusion to be drawn with consequences for understanding dysfunction; it is that, on my analysis, dysfunction is not directly opposite to function. My argument is that function is those capacities operating in the context of a person that facilitates their agency. But dysfunction (at least on my second account of function) is not loss of function but negative function, a (dys)capacity that vitiates (rather than fails to facilitate) agency.
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On this basis a (dys)capacity such as a big nose, which I feel makes me look ugly, vitiates my agency – I can’t engage with the world (socially) in ways that I feel I should be able to take for granted (because that is how I see other people engaging). This (for me) dysfunctional (dys)capacity is not a dysfunction because any particular function has failed or is malfunctioning, but because it produces a (dys)capacity that vitiates my agency. Function and dysfunction thus relate to one another through the medium of agency – function facilitates and dysfunction vitiates agency.

6.5. Two concepts of function

My conclusion finally is that there are two distinct ways in which the term function is conceptualised in practice. The first defines the normal behaviour of parts of the body. The second relates to the ability of an individual to function, that is, to engage with their physical and social environment in taken-for-granted ways. I have described these in terms of $F_{\text{biol}}$ and $F_{\text{pr}}$, where $F_{\text{biol}}$ is the concept of function that is foundational to biology, and $F_{\text{pr}}$ describes the way a person (and their practitioner) expects (them) to be able to function in a social/environmental context. $F_{\text{pr}}$ is distinguished from $F_{\text{glob}}$ by $F_{\text{pr}}$ referring to what is taken-for-granted for ‘someone like me’, while $F_{\text{glob}}$ is what I can actually do. In Chapter 7 I will show how these inform the different concepts of function I identified in the Introduction as characterising osteopathic and conventional medical practices. I will argue that $F_{\text{ost-phys}}$ is equivalent to $F_{\text{med-phys}}$ and informed by $F_{\text{biol}}$, and $F_{\text{ost-glob}}$ is equivalent to $F_{\text{med-glob}}$ and informed by $F_{\text{pr}}$.

A further conclusion is that both concepts of function are used by practitioners though to different degrees, and they are both necessary to explain illness. What is not yet clear is how the two come together and how $F_{\text{ost}}$ and $F_{\text{med}}$ emerge from $F_{\text{phys}}/F_{\text{biol}}$ and $F_{\text{glob}}/F_{\text{pr}}$.

77 I am deliberately using the narrower context of a person rather than biology in general, because my interest is primarily in function in practice, but also it is not clear that my conclusions about function apply also to biology.
6.5.1. Function as defining 'normal' biological behaviour vs. the facilitation of agency

Practitioners make judgements about how well a body part is working; they want to know whether or not to intervene with treatment, and how best to advise a patient. This is different from biologists who want to know what the normal, i.e., proper function of a part is in order to place it in the greater body of knowledge that is biology. I have argued that theorists' attempts to define biological function in scientific descriptive terms remain problematic, but that some kind of biostatistically defined concept of normal function is essential for practitioners. The question then is what kind of concept this might be. I have argued, in support of Scadding, Reznek and others, (De Vito, 2000; Reznek, 1995; Scadding, 1996) that the biological notion of function, along with its derivatives of dysfunction and disease, are nominal concepts, that is they are states that are recognised and agreed by practitioners to be causal of or clinically significant to the way illness is understood and managed. But what is 'clinical significance' based on?

If the search for descriptive accounts of function is abandoned or left for biologists to wrestle with, what is the conceptual basis to nominalist accounts? The nominal account of time, for example, is based on the rotation of the earth. The problem for accounts of illness and disease as Reznek and others have pointed out, is that there is no concept of disease-ness. Without clear scientific accounts of function and dysfunction (which for time would be equivalent to earth rotation) there is nothing solid to build on. But medical scientists and practitioners do use concepts of function as if they are solid and dependable – blood is analysed and treatment based on findings, other deviations from normal are used as reliable indicators of disease and so on.

In Chapter 2 I outlined accounts of disease and illness based on notions of welfare, the ability to achieve vital goals and so on. (For example, Nordenfelt, 1995b) These question the assumption that health is the absence of disease and illness explained by disease. Fulford (1989) perhaps goes furthest when he argues for a "reverse view" of disease in which those states that are recognised as disease depend logically on the concept of illness
Part 3 – Further Analysis of Function Statements

rather than on the conventional understanding in which illness is the conceptual and causal consequence of disease. Fulford’s conception of illness as “action failure” is based on a person considering themselves to be ill when they fail to be able to act in “ordinary” ways. My analysis focused on illness as loss of agency on the grounds that illness is an inability to do things that are normally taken for granted (where it is close to Austin’s “ordinary doing” that Fulford uses). On my account a person is an agent when they can (or they perceive themselves to be able to) act in taken-for-granted ways. I criticised Fulford’s account because although action failure implies action with a particular purpose taking place in a specific context, it fails to make the context in which the action takes place explicit. Neither does it distinguish clearly between actions, what their purposes are and whether any particular action is reasonable in the context in which it takes place. In other words, what the (mental) intentions of the acting person are. All these judgements are entailed by practitioners’ examination and diagnosis. Context, I have argued, is crucial to fully understanding both function and, particularly for practitioners, dysfunction where the same behaviour may be normal function in one context but dysfunction in another; intended in one situation and unintended in another. What is important to someone is not just the ability to perform an action per se, but to be able to do things that give meaning and value to their life – pick up their child, dig the garden, go to work, play football and so on. These are more explicitly explained in terms of agency than of aggregated actions, though clearly agency is made up of actions. On this account the person has a functional capacity (F\text{pt}) in a larger context – as a mother, gardener, footballer, etc. This does not define a person in functional terms – though in fact it often happens that a person (mistakenly) is perceived as a lawyer, doctor, mother and nothing more – one of the characteristics of being human is the ability to act in a number of different capacities, thereby entering into different functional relationships.

An important consequence of this argument is that F\text{pt} (as well as F\text{biol}) informs F\text{dis} through F\text{glob}. This is because not all deviations from normal function are necessarily disease, only those that prevent F\text{glob} equalling F\text{pt}.
6.6. Summary of Part 3

Part 3 critically examined the claims for biological function as a descriptive scientific concept. It identified two distinct strands in the literature, one focusing on the proper (scientifically defined) behaviours of organs and other parts, and the other on the systematically organised behaviour of an organism's properties and capacities in implementing the goals of the organism. The claim that function can be defined scientifically using natural selection or species-typical analysis was examined and found to contain serious flaws. Robert Cummins's account, which has also been criticised for its failure to make explicit the difference between true and non-functioning systems, seemed at least to offer an explanation that distinguished between the behaviour of local parts and the "greater capacity" of the whole organism.

This was further developed and adapted to apply it more specifically to clinical practice, where Part 2 had identified that practitioners use both physiological ($F_{phys}$) and global ($F_{glob}$) concepts of function. On this analysis, functions are those (lesser) capacities that facilitate agency and dysfunction those (dys)capacities that vitiate agency. A consequence of this analysis is that dysfunction relates to function through the concept of agency – i.e., it achieves the opposite of function – rather than being non-function or failed function. Dysfunctions are those (dys)capacities that vitiate agency.

The task for Part 4 is to show how function concepts inform what practitioners actually do, the accounts they offer to explain them and, finally, to return to the question raised in Chapter 1 about the different ways that osteopaths and conventional medical practitioners conceptualise function.
Part 4

Implications for Practice
Chapter 7. Conceptualising Function in Osteopathy & Conventional Medicine

In Chapter 7 I return to the practice issues, first identified in Chapter 1 and further elucidated by the Case Studies in Chapters 3 & 4, to ask how we can now understand the various ways function terms are used by osteopaths and conventional medical practitioners. I argue that illness, disease and dysfunction (foundational concepts in both professions) operate as a hierarchy of concepts in which illness refers to the incapacity (or loss of agency due to the incapacity) of persons engaging with their physical/social environment; dysfunction is the (dys)capacity of particular parts that constitute the global incapacity (thereby vitiating agency). Diseases are nominalistically defined biological phenomena in which dysfunction, commonly described in pathophysiological terms, is a significant defining component.

Osteopathy is distinguished by its unwillingness to accept an ideal norm for $F_{pr}$ (an implicit assumption of conventional medicine). Instead it takes $F_{pr}$ to be an evaluative concept informed by cultural, sociological, psychological and scientific insights into human-kind. I argue that the way $F_{pr}$ is understood determines the way action/agency of persons is understood — the ability to engage with the world in taken-for-granted ways, the majority of which entail physical activities — and therefore the way illness and the work of practitioners is understood. Enabling patients to be effective agents (rather than trying to achieve a mythical ideal) is therefore the true work of practitioners. Because of osteopathy's primary concern with the musculo-skeletal system, it more naturally focuses on peoples' physical engagements with their worlds.

The final task is to draw strands together in order to address the issues identified in Part 1 plus further examination of the dualities identified in Part 2. Where do the main differences between primary and secondary care and between osteopathy and conventional medicine lie with respect to their use of function terms? My initial analysis suggested that practitioners use (at least) two concepts of function that begin their work from different assumptions; from the assumption that parts of the body have normal (or proper) functions, and from the notion that what is important to people who are ill (and
which defines their sense of being ill) is their ability to engage in everyday taken-for-granted activities. A number of important questions arise from this:

- Which concept drives the diagnostic process; is the primary concern of the practitioner to correct dysfunctioning parts or to enable the patient to return to taken-for-granted activities;
- do these necessitate different modes of enquiry;
- are the two concepts distinct and separate, or do they share common elements;
- does the distinction contribute to our understanding and conceptualisation of illness and disease?

I will begin with this last question by picking up from my analysis of practice theory, which focused on the foundational concepts of illness, disease and dysfunction. This can then be applied to the different interests osteopaths and conventional medical practitioners demonstrate in their patients in order to show how function ascriptions inform their work.

7.1. Analysis applied to illness and disease

In Chapter 2 I outlined the general arguments and logical relationships entailed by the concepts of illness and disease; function is fundamental to explaining both. On naturalistic accounts of disease, the loss, perversion or absence of a proper function can lead to dysfunction which in turn explains the mechanism of disease. But this depends on being able to define function non-evaluatively. Normativists' accounts place disease within a welfare model where diseases are those states that are harmful to the organism. Function here describes states that contribute to the good of the organism and therefore entails values. Illness too is informed by concepts of function, but where function is focused more on the person's ability to act in a broader context as a shopkeeper, father, sportsman, gardener and so on. The ability to be an agent and act in taken-for-granted ways is fundamental to our judgement of whether we are ill or well. It is likely that
differences between practitioners will be defined by differences in explaining patient illness, i.e., the diagnosis of disease and dysfunction.

7.1.1. Disease

In order for the “naturalistic cascade” (Fulford) to be descriptive it is both sufficient and necessary that function be defined in non-evaluative ‘scientific’ terms. Naturalistic accounts of disease depend on the assumption that parts have proper functions that form a referential standard for testing all similar examples. By comparing particular examples with a standard, judgements of normal function or function failure can be made. Although describing a part as ‘failing’ may appear to involve value judgements, naturalists claim that it is no different from describing a machine with a failing cog. In this case an engineer doesn’t need to use value-judgements to identify what has ‘failed’.

But there are important differences between organisms and machines. One is that machines don’t operate within a system of competing goods. What is good for a machine is defined by the intentions of the design, but what is good for an organism is much less clear as my previous analyses have demonstrated. Even if it were possible to provide an equivalent account of intention in biology (as naturalists claim they can), there are still important differences between machines and organisms. Organisms in general, and people in particular, can pursue a range of competing goods, including aesthetic ones. In sport, for example, football and jogging may be good for cardiovascular and musculo-skeletal fitness, and have psychological benefits, but may lead to damaged joints, a propensity to injuries, produce “adrenaline junkies”, and perhaps interfere with social relationships. It is therefore not clear whether jogging is a medically good activity for human beings.

In addition to competing goods for any particular organism, there may be competing goods between organisms. What is good for a pathogen can be bad for the host; what is good for a mother may be bad for the infant, and vice versa. What is good for an organism, may be bad for its environment. The key issue is whether the goods that
functions aim to achieve can be defined non-evaluatively, or always depend on value-laden intentions.

The problem for normative accounts of disease is that it is unclear how practitioners can develop a useable concept. Hesslow’s argument that concepts of disease have no practical use is well made. (Hesslow, 1993) On a normative account practitioners deal with illness in all its complexity and it is difficult to see how adding a further layer of ‘disease values’ contributes to the solution.

While a strict nosology that depends on real diseases cannot be supported philosophically, a normative account that takes all aspects of welfare into account has little practical application. So can my analysis of function ascriptions, and particularly the intrasystemic account, help to bridge this divide?

I argued that practitioners deal with dysfunction of major organs and body systems, and describe diseases as if they are objective and value-free. This is because of the need to make judgements about whether or not to intervene therapeutically. As a counter to that I highlighted Thompson’s conceptualisation of diseases of the elderly in functional terms, and osteopaths’ tendency to focus on dysfunction rather than (and not as the basis for) disease, as explicitly questioning conventional assumptions about disease as the real, objective, value-free entity that explains illness. This does not, however, mean that the sciences of physiology and pathology have no basis or place in practitioners’ judgements; even on Thompson’s account clearly they do, rather it is that physiology and pathology describe dispositions/properties and the lesser capacities of body parts and not a whole disease. On a Cummins-style analysis, physiology and pathology do not describe function and dysfunction; cells and tissues are merely disposed to behave in particular ways. If they were the same, it would be possible to state the function formula as ‘the function of x is y’ rather than ‘the function of x is to do y’, which, as was discussed in Chapter 2, fails to distinguish function ascriptions from descriptions of property. Function describes a particular kind of relationship between x and y, where y is an ‘intended’ outcome. It is the outcome of the effects of x that informs the functional statement.
Disease (distinct from pathology) is dependent on notions of function and dysfunction because of its consequences for human beings.

Disease, while it may be a (scientifically) definable and distinctive state of affairs, is not important because it is different in kind from other, normal, states of affairs, but because the outcome of its constituent mechanisms disbenefits, or has the propensity to disbenefit, an organism. More specifically, what is of interest to the practitioner is not merely the disposition that an item has but its overall effect on the organism.

Disease, then, is dependent on the concept of function, and is evaluative to the extent that function and dysfunction are evaluative. But the mechanisms that give disease its particular (value-laden) capacity, are not themselves value-laden; pathological mechanisms can be described scientifically, which means that the mechanisms that cause (though do not fully define) disease can be described scientifically. It is possible, for example, to describe, in value-free terms, the physical effects cancerous cells have on an organ. The problem for naturalists is that this information is not enough to understand the disease because it doesn’t tell us how it affects the organism or why practitioners should take an interest in it.

The concept of disease entails pathophysiological dispositions operating in a system with a capacity that is value-laden in the context of the organism, i.e., it incapacitates the organism. What differentiates a (dys)capacity that is categorised as a disease from one that is not, is its propensity to disbenefit the organism in some significant way. The nature of the disbenefit is complex and a full account of it is beyond the scope of this thesis, suffice for the moment to suggest that in part it entails the patient’s experience of illness, which, I have argued, is informed by a person’s agency, i.e., activities they take for granted. Because what is taken-for-granted entails values, those states of affairs that vitiate someone’s agency, i.e., dysfunctional/disease states, are also value-laden.

I began this section by saying that practitioners use the concept of disease as if it is a real, value-free state of affairs in order to make effective decisions. In other words there are
good clinical reasons why disease needs a nosology. Despite my claim that disease cannot be defined scientifically, outcomes from clinical interventions are effective; disease does (contra Hesslow) have practical importance for practitioners, but only as a subcategory of illness. How does my analysis of function help understand how disease is conceptualised by practitioners? To be successful it must take account of the evaluative nature of disease ascriptions and address the practical need of having a well defined set of criteria to aid decision-making and communication between practitioners.

I showed, using the example of stroke, that disease is not a natural kind. Different medical communities define stroke and other conditions differently. Thompson's 'octad' of diseases claims to be a more useful nosology for understanding illness in the elderly. Hypertension can be redefined by changing the criteria for normal. Disease, from these examples, is a nominal categorisation of those pathophysiological states that explain (in part) illness. Disease ascriptions are evaluative because they define those particular pathophysiological states that have a harmful effect on the organism as a whole. Pathophysiological states per se are value-free descriptions of the properties of parts and open to proper scientific inquiry, but the question of what those dispositions are good (or bad) for, is an evaluative matter. To put this in Cummins's language, the "greater capacity" of the disease is subject to an analytical strategy to identify the parts that contribute to it and the effect it has on the organism as a whole; while the properties/dispositions of the pathophysiological mechanisms that form the disease's (dys)capacity are subject to an instantiation strategy.

This mirrors what happens in artefacts, where some items, such as chairs and can-openers have 'proper', intended functions while others, such as planks and iron bars have dispositions/properties that can be used in many functional capacities. Analysing the suitability of a chair to do a job involves comparing its intended capacity with the use to which it is put - capacity matching utility - but analysing a plank is simply a matter of identifying (and describing) its properties/capacity.
On this account, disease, entails value-free pathophysiological events that may (or may not) be judged (evaluatively) to be part of a (dys)capacity that is harmful to the organism. The focus of disease is on some particular aspect of the organism.

7.1.2. Illness

So what does my analysis say about the concept of illness? Most naturalistic accounts, with the exception of Boorse (1997), accept that illness is an evaluative concept. For them it is the main reason for wanting a value-free account of disease and for making the treatment of disease the main focus of medical care. Patients bring all kinds of values into their summative assessment of whether or not they are ill, which can leave the practitioner unclear as to whether they are dealing with a proper medical problem or a psychological, sociological or moral problem. Much better, they say, to be clear about what medicine can deal with and leave the rest to psychologists, sociologists, priests and the courts.

I have tried to show that this approach, seductive as it is, is not possible. Drawing on Fulford's "reverse view" of illness and disease (in 2.2.3.1.2, p.80), I reviewed his argument that what is defined as disease is logically dependent on what is perceived to be an illness; those pathophysiological states that cause illness are identified as diseases not because of any innate quality that makes them diseases, but because they are the causes of outcomes that are bad. If this is correct then the naturalistic argument just described will not do, for the way we understand disease is dependent on how we conceptualise illness - understanding illness is foundational to understanding disease - which means that practitioners cannot address disease problems apart from the value-laden context in which illness occurs.

In Chapters 2 & 3 I argued that someone perceives themselves to be ill because they are unable to do things they normally take for granted; they have lost some aspect of their agency. I pointed out that problems are presented to practitioners in the context of activities - I get pain when I walk upstairs, lift my child, etc. - and that practitioners seek information about a problem by asking what aggravates and relieves it, what someone
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was doing when it started and so on. The concept of illness depends heavily on the notion of a person acting in characteristically human ways, ways that normally are just taken-for-granted. Function, I argued, is ascribed to those traits and behaviours that facilitate agency, and conversely, dysfunctions are those effects that vitiate agency. Patients base their perception of being ill and consult practitioners because they believe that their agency has been (or could be) vitiated. An important aspect of practitioners’ work is enhancing patients’ agency whether or not they are able to cure their disease. Even when a patient is dying, a practitioner will do all they can to reduce suffering thus enabling the person to cope as well as possible and have a ‘good death’.

There is no difference in principle between a patient’s judgement that their agency is vitiated and the practitioner’s assessment of global function ($F_{glob}$), i.e. understanding a problem in the context of a particular whole person, including their actions in pursuit of goals. Both define illness. Foundational to the concept of illness is the notion of the overall capacity of a person, a capacity that enables them to act in ways they just take for granted. A practitioner may have a specialised view of what can be taken for granted informed, in part, by scientific knowledge, but in principle it is no different from the patient’s perception informed from personal experience, cultural and media influences. The notion of taken-for-granted becomes explicit when practitioners tell patients that “it’s normal for your age”,78 as part of a claim that nothing is wrong. The capacity that serves to enable a person to be an effective agent and do the things they just expect to be able to do can, of course, be analysed. Here the rôle of the practitioner is to explain the loss of ‘greater’ capacity (as a whole person) in terms of loss of ‘lesser’ capacity (of a constituent system, or organ), and where possible to further analyse the loss of lesser capacity in terms of constitutive loss of dispositions.

78 “It’s normal for your age”, “You can expect that at your age” or similar statements can be used to reassure that there is no disease, dysfunction or abnormality at any age from birth onwards. It is a way of saying that it is part of what you can take for granted.
At this point the analyses of function in disease and in illness start to converge. I argued, based on Cummins, that disease entails two main elements, a scientific understanding of the dispositions/properties of constitutive parts and an holistic understanding of the way those parts operate together in a system with a global capacity. A capacity, on Cummins's account, is a function where it makes a beneficial contribution to the organism. Illness, I argued, is defined from a global loss of "greater capacity" in the context of the person's agency; in addition, it is the concept from which disease is logically derived. On this account there is no disease without (a concept of) illness; so in those cases where a person has, say, asymptomatic cancer of the stomach and where there is therefore no loss of agency, the designation of this state as a disease is based on the knowledge that at some point in the future it may seriously affect the person's agency, a judgement that depends on a clear concept of the illness associated with stomach cancer. Where no illness results, for example in wrinkling of the skin, greying of hair or gradual stiffness of movement – effects that are taken for granted as part of getting older – no disease is diagnosed.

The nominalistic account of disease I am advocating starts from and overlaps with the concept of illness. Those dysfunctional (dys)capacities, perhaps caused by pathology, that vitiate a person's agency gain their dysfunctional value from the patient's perception that they "are really ill" ($F_{glob}$), which in turn is based on assumptions of human action entailing what can and can't be taken for granted ($F_{pt}$). Disease picks up from this judgement and attempts to explain it in terms of lesser (dys)capacities contributing to the organism's (in)capacity. In Chapter 2 I argued that illness is defined more by the incapacity of the person than by the dysfunction of any part, and I concluded the Section above by saying that disease concepts focus on the (dys)capacity of particular parts of the person (or organism). On an intrasystemic analysis it can now be seen that illness, disease and dysfunction operate as a hierarchy of concepts in which illness refers to the incapacity (or loss of agency due to the incapacity) of the person operating in a social or environmental context, dysfunction is the (dys)capacity of a particular part(s) that contributes to the global incapacity (thereby vitiating agency) to which illness refers, and
disease, a particular (medically defined) incapacity in which the dysfunction is of a particular scientifically definable kind, (most commonly pathology).

I drew attention (in 5.2.2.1.2 on page 205) to the criticism of Cummins's account that he doesn't say what differentiates a system that is a function from one that isn't. I have tried to address this issue by suggesting that systems that facilitate agency are functions (and those that vitiate agency are dysfunctions). But this still leaves open how to differentiate true functional capacities from merely useful ones – the ability of a nose to support spectacles, shoulders to hang jackets on and so forth. I might argue that the ability of my nose to support glasses facilitates my agency because it helps me see more clearly and therefore act more effectively. But these are no different from numerous other ways I can choose to use capacities, such as my legs being useful to drive a car and my arms to carry luggage. These don't describe the functions of arms and legs in the same way that pumping blood describes the function of the heart.

Arms have a capacity that can be used to carry luggage if I choose but entailed within that choice is the fact that I take it for granted that I can use my arm in that and a variety of other ways. I cannot choose how my heart, liver or gluteus maximus function, but I can choose how my arms and legs function (within the limits of those activities that I take for granted). I have more control over my skeletal/muscular system than I do over my liver and heart, but only in the context of specific actions – I can't control one muscle in isolation, contracting gluteus maximus also involves contracting or relaxing antagonistic and synergistic muscles, as well as supportive vascular and neurological functions. On the other hand, incapacity of one muscle can affect a whole range of specific activities.

Likewise, noses can be used to support glasses and shoulders to hang jackets on. This doesn't make them functions any more than my arms' functions are to carry bags and hail taxis. Other body parts, such as hearts and livers perform their functions whether or not I choose.
The ability of my arm to function is part of the way that I function, and is different from the ability of my heart to function even though my heart is necessary for me to function.

Illness, then is more than simple loss of function, it is loss of agency, where agency entails those activities that are taken for granted, whether or not they are actually utilised. It therefore describes a global (in)capacity that needs to be further analysed in terms of lesser (dys)capacities.

So what does this mean for differences in the way that practitioners focus on patients' problems?

### 7.2. Analysis applied to primary and secondary care

Primary care practitioners, by definition, interpret patients' symptoms as they first present. This involves more than making a diagnosis, it involves identifying what is medically (or osteopathically) relevant. In addition, and frequently under-emphasised, it also involves understanding a patient's symptoms in the context of their life's experiences in order to explain to the patient what is wrong. Secondary care practitioners are more commonly given difficult technical or complex biological problems to solve. In this case the context of a patient's life experiences is relevant only to the extend that it informs the biological decision-making process and makes a biological answer more or less successful.

#### 7.2.1. Primary care

In primary care the concern of the practitioner is to decide, first, whether a problem is medical (or osteopathic), or some other kind, such as social, psychological, spiritual or moral, i.e., of deciding whether the person "is really ill". In terms of my analysis this means judging whether some part of the patient's illness, their loss of agency, is due to the (dys)capacity (or failure) of a biological part. This entails a standard of normal or proper and, regardless of whether the concept of normal/proper function can be defined non-evaluatively, of judging actual cases against professionally recognised standards as if they are value-free.
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I have also tried to show that this is not simply a matter of screening patients and ‘mending’ broken parts. Everyone has some aspect of their physiology that falls short of ‘normal’ standards – hence Murphy’s definition of health as someone who hasn’t had enough medical tests – and the primary care practitioner must therefore judge whether an ‘abnormality’ is a relevant component of the illness (loss of agency). On a naturalistic account this occurs in the context of disease recognition; if a subnormal part is constitutive of a known disease (part of the triad of signs/symptoms, pathology/dysfunction, and aetiological agent) illness is explained in terms of the disease, and other subnormal or abnormal elements may be ignored. The naturalistic focus is on recognising signs associated with known disease states. The normative focus is on identifying those states, whether diseases or not, that are bad for the organism and, on this account, the practitioner must judge whether the abnormality is actively contributing to the illness. Here, the practitioner will interpret illness in terms of pain, dysfunction, sickness, etc., and values will be implicit.

Primary care practitioners’ first concern is to assess how patients are able to live their lives and whether any loss of agency is for medically relevant reasons. Here, values are explicit. Patients are not just biological mechanisms; practitioners want to do what is best for them as people. The focus on function here is on the activities and behaviour of the person rather than their biological parts. It may involve the practitioner suggesting non-biological intervention, such as aids around the home, social support and life-style changes. People do not function in a social capacity merely as biological mechanisms, though it is through their biological mechanisms that they engage with their environment. People value particular kinds of engagement; they take it for granted that they can, or have the potential to, act in a variety of ways. I have argued that what drives someone to consult a practitioner is the loss, or feared loss, of a capacity that significantly affects their agency. I have also argued that it is loss of agency presented as illness, rather than the presence of a disease, that drives patient/primary care practitioner consultations. This means that pathophysiological activities that vitiate agency (explicitly or implicitly) are
the focus for practitioners. An abnormal skin blemish is not a disease because it is not perceived to vitiate agency, while a melanoma is.

The second concern is to try and explain the loss of agency in terms of (dys)capacities. This entails filtering a patient’s presenting signs and symptoms in order to judge whether it is a legitimate medical/osteopathic concern and which biomedical/biomechanical abnormalities are relevant to understanding the patient’s illness. This information is used to decide how to intervene therapeutically which may involve referring to a secondary care practitioner.

Some non-pathological states vitiate agency. A person with a large ‘port-wine’ stain across their face, sticky-out ears or some similar feature, may seek cosmetic surgery on the grounds that these vitiate social interactions. A doctor may endorse such a request on the grounds that it is adversely affecting the person’s health. Keith Thompson’s papers (1986, 1992) make explicit the two judgements that practitioners make for all patients – what pathophysiological states there may be and the extent to which it is vitiating the person’s agency. All elderly people have abnormalities, but only some of these vitiate agency. GPs are frequently involved in assessing whether a person is truly disabled and requires aids, a disability allowance, or should have preference on waiting lists for surgery. Here the judgement is not about how severe the abnormality is but how much it is affecting the person’s ability to act, though these will frequently correlate.80

Primary care practitioners, I conclude, work from two overlapping concepts of function. The first is $F_{phys}$ where practitioners work from knowledge of body parts operating in

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80 A patient of mine who had polio as a child, which left her partially disabled, recently applied for a disability allowance. It was turned down not because her disability wasn’t severe enough, but because she had found all kinds of ways herself of adapting to overcome her difficulties.
species typical ways. However, without a value-free account of function, or the explicit aim of correcting all abnormalities, practitioners must select particular abnormalities for special attention on the basis of how much they are disturbing a patient’s life ($F_{\text{glob}}$). This does not mean that physiological knowledge is evaluative; as I have argued, knowledge of physiological processes is truly scientific, but full understanding requires knowledge of how properties and processes fit together in the context of an organism and it is here that values enter. The fact that certain tissues behave in a particular way does not inform us about how they contribute to the body economy, and, more importantly for practice, which dysfunctions are contributing to a patient’s loss of agency. At a primary care level, practitioners must judge which properties deserve attention. $F_{\text{pt}}$ forms the basis for judging a person’s global function ($F_{\text{glob}}$), and within that, which (dys)capacities are contributing to the patient’s problem. $F_{\text{glob}}$ and $F_{\text{pt}}$ are therefore of special interest to primary care practitioners as they form the basis of both $F_{\text{med-glob}}$ and $F_{\text{ost-glob}}$.

Analysing and evaluating which (dys)capacities are relevant to a problem requires a different analytical strategy from that for judging whether or not a part meets an agreed standard of behaviour. Cummins, as I described earlier, argues that analysis of function involves two distinct strategies, an Instantiation Strategy that examines the dispositions/properties of component parts (which, I argued, is a true scientific endeavour) and an Analytical Strategy that focuses on the capacity of systems produced from the integrated interaction of dispositions. This entails values because only those capacities that benefit the organism are considered to be true functions.

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81 The fact of this assumption is distinct from the question of whether defining function of parts in species typical ways entails values. Criticism of Boorse’s BST does not mean that biostatistical analyses are not useful, merely that they do not provide value-free information. My point is that practitioners rely on some referential standard in order to judge the state of a particular case, but the values that inform the standard need to be debated and re-examined from time to time.
I am now suggesting that for practitioners trying to explain illness and particular presentations of dysfunction, an additional strategy, similar to the Analytical Strategy, is required. This involves an Ontological Strategy in order to assess which (dys)capacities explain the overall incapacity. The illness state is explained in terms of particular effects that operate together; this parallels Cummins's account of normal function, but with a vitiating effect on agency. On the presumption that a state of illness is different from a state of health (at least to the patient), and without implying anything about states of health, the role of a primary care practitioner is first to decide on which (dys)capacities constitute a state of illness – the greater incapacity on which the illness is ontologically dependent. The challenge is to decide which (dys)capacities are necessary and/or sufficient to explain this distinct state. The strategies for achieving this are various – hypothetico-deductive reasoning (Briskman, 1988), pattern recognition (Balla, 1985; Bradley, 1993 p.58-64), Bayesian analysis (Balla, 1985; Bradley, 1993; Macartney, 1988), and the intuitive hunch (Hunter, 1996). The philosophical rationale I am suggesting parallels function in artefacts. What practitioners are trying to do when they undertake these clinical strategies, is to explain why this patient at this time is experiencing this illness (an experience that is different from that which they normally take for granted as the human condition). But only some differences from a generic normal will be ontologically linked to the illness.

Unlike biologists, practitioners deal with unique situations. What makes illness unique is the way biological abnormalities affect individuals, where individuality is generated from several distinct sources. First is the individual genetic make-up that, in addition to a distinct phenotype generates a distinct morphology. Second are the adaptations and compensations that occur in response to previous illnesses, traumas, occupational factors, and so on which modify the morphology. Together these produce a physical structure and physiological response that is unique to that individual – no one else has exactly that genetic makeup or has had experiences and adapted to them in exactly the same way. Finally, each patient's cognitive understanding and affective response to these challenges will be different. The practitioner's job is to interpret this complex situation. Primary care
practitioners identify patients' illnesses by explaining the loss of agency in terms of particular (dys)capacities that are judged to be vitiating the patient's ability to act in ways they take for granted.

The primary focus on facilitating patients' abilities to act in ways they take for granted is borne out by the Case Studies where the GP, physiotherapist and osteopath all placed great emphasis on the global function of patients (but not to the exclusion of biological function). This was most explicit in the osteopathic and physiotherapy accounts, and implicit in the GP's recognition that Bill's previous episodes of back trouble and the threat of redundancy were factors influencing the total picture. On my analysis the illness as a whole is ontologically dependent on all these states in addition to any pathological lesion. For Bill, a prime motivation for seeking help is because his agency is threatened by back trouble and he can't work or look after his wife as he expects. The orthopaedic surgeons in both studies are more interested in evaluating the pathology and functional capacity of the local area, though even here, it is placed in the context of patients' lives. Which leads to looking at the way secondary care practitioners use the concept of function to explain patients' problems.

7.2.2. Secondary care

In secondary care, practitioners are dealing mainly with clear biomedical situations, primary care practitioners having already filtered out most non-medical states. A patient is referred on because their problem is believed to be a genuine medical one, but the diagnosis is uncertain or there is some technical problem to be overcome that only a specialist secondary care practitioner can address. One of the main concerns is to place the problem in a known diagnostic category or to identify which parts may be dys- or mal-

Interestingly it was perhaps demonstrated most clearly in the Patient Study and the physiotherapist's heading of 'Expectation', in which he explicitly asked each patient what she was anticipating as an outcome from the consultation and treatment. This implicitly acknowledges what is motivating the patient to consult the practitioner.
functioning or to have failed. Secondary care practitioners therefore focus on the proper behaviour of key parts and generally are less concerned with $F_{\text{glob}}$. Hospital-based secondary care, in particular, focuses on diseases and pathological states in the context of specialised knowledge of rare conditions or unusual presentations of more common ones. This relies on standardising body behaviour both in sickness and in health.

My argument has been that while standards may not be value-free, some kind of standardisation is necessary for making decisions on treatment in order to allow professionals to communicate with one another, and as a framework for developing medicine's body of knowledge. The main focus in secondary care is on $F_{\text{med-phys}}$ based on $F_{\text{phys}}$ and $F_{\text{biol}}$.

The differences I have outlined between primary and secondary care practitioners are differences of degree. Although primary care practitioners are particularly interested in the global functioning of patients, they also attend to local function to explain causally a patient's illness. This depends on knowledge of 'normal' function in order to make judgements about dysfunction and disease. And secondary care practitioners although mainly interested in local tissue changes and technically challenging biomedical problems, do so in the context of a person with a life outside the hospital. Some of their judgements are made, albeit implicitly, in the context of the person's personal goals and expectations.

Nevertheless the two areas of practitionership will tend to demonstrate differences in approach because of differences in the way they conceptualise the problem and the different modes of enquiry required to analyse them.

7.2.3. **Different modes of enquiry**

How do the different foci of primary and secondary care practitioners affect modes of enquiry, i.e., clinical practice? Secondary care practitioners (more than primary) test information about the patient against referential standards. These standards may be physiological criteria of normality or text book descriptions of dysfunction and disease.
Primary care practitioners, in addition to testing parts against a standard, also place that information within a global picture.

I argued in 7.2.1 that an Ontological Strategy is required to judge which (dys)capacities are relevant in explaining the illness – describing a state of ontological dependency. The GP in the Case Vignette is somewhat ambivalent about the extent to which psychosocial factors are relevant, whereas the osteopath considers them to be an integral part of the total problem; the orthopaedic surgeon only considers them relevant because of their "adverse effects on recovery" not as integral components of the problem itself. His strategy is more epistemological; he wants to know which category the trouble can be placed in rather than what kind of problem it is, which is already assumed.

In practice both Epistemological and Ontological Strategies are necessary for making the kinds of judgements practitioners, but particularly primary care practitioners, must make. Part of deciding whether or not some element is a component of the (dysfunctional) system entails knowing whether its behaviour falls within normal criteria. So for example, if a patient complains of lethargy and weight gain, the practitioner will want to test thyroid function to see whether it falls within normal limits. The result of this will inform, but not necessarily determine, the final diagnosis. Hypothyroidism may be a straightforward problem, but its relative simplicity is deceptive. When a patient with back pain has an x-ray it may show anomalies or pathology. The practitioner still has to make a judgement about whether or not these are relevant to, i.e., an ontological part of the (dys)capacity causing the pain. Thompson makes this explicit in his account of diseases of the elderly. The presence of pathology is not an infallible indicator that it is causally related to the patient's illness. All elderly people have pathologies that do not necessarily vitiate agency.

7.3. Analysis applied to $F_{ost}$ and $F_{med}$

What are the implications for understanding function in osteopathy and conventional medicine? So far differences between them have been in emphasis rather than substantive. $F_{ost}$ and $F_{med}$ are different from each other only to the extent that the
subcategories of $F_{\text{ost-phys}}$, $F_{\text{med-phys}}$ and so on, are emphasised differently. These, in turn, are different because their main focus is either on the function of constitutive parts, or on the global function of the person. Key practitioner differences may not be so much between osteopathy and conventional medicine as between primary and secondary care.

### 7.3.1. The concept of function in osteopathy

In the Introduction I identified four distinct ways in which osteopaths use the term function. Function as physiology ($F_{\text{ost-phys}}$) where different parts are ascribed functions in accordance with text-book physiology. Function as a global concept ($F_{\text{ost-glob}}$) where individual parts are considered in the context of whole body function ($F_{\text{glob}}$). This is applied, thirdly, to understanding biomechanics, ($F_{\text{ost-glob(mech)}}$) where the behaviour of a part, the knee say, is considered in relation to the hip, foot, pelvis and so on. Finally, function as used to describe palpation findings ($F_{\text{ost-palp}}$); here, tissues are judged to be functioning well or not well according to what they feel like. These sensations of touch are described variously in terms of texture, ease/bind, reactivity, fluidity, firmness and so on. To what extent does my analysis of function help to explain these variations?

#### 7.3.1.1 $F_{\text{ost-phys}}$

Osteopaths use function to mean the normal capacity of body parts in the same way that conventional medical practitioners do. I argued earlier that the link between function and physiology is far from clear. Knowing, from scientific analysis, what the properties of an item are is different from knowing what its proper place in the whole body economy is. The former is of little practical use to practitioners who want to know not just what it does but how it relates to other activities in the body. But knowing how it relates requires knowledge of which properties are good for, or how they benefit an organism.

My analysis, based on Cummins, argues that scientific information about properties and dispositions provides knowledge of body processes together with nominally agreed criteria for assessing whether or not a part being examined falls within normal limits. $F_{\text{ost-phys}}$, therefore, defines the disposition parts have to behave in particular ways; it also
defines the behaviour of lesser capacities, i.e., systems of dispositions operating together in an integrated way as part of a larger capacity. So for example, the heart is a system with the capacity to pump blood that is made up from parts with necessary properties, such as valves, non-striated muscle cells, pericardium and so on. Some of these, such as the bicuspid valve for example, are lesser capacity systems in their own right, but others such as single muscle cells cannot be said to have a function merely a disposition to contract; contracting only has a function when it is done in the context of the myocardium. There is no substantive difference, therefore, between, \( F_{\text{ost-phys}} \) and \( F_{\text{med-phys}} \) and both can be reduced to \( F_{\text{phys}} \).

7.3.1.2 \( F_{\text{ost-glob}} \) and \( F_{\text{ost-glob(mech)}} \)

I will deal with the second and third concepts of function together. Osteopaths, perhaps more explicitly than conventional medical practitioners, work with a global concept of function (\( F_{\text{glob}} \)) within which the behaviour and capacity of items are placed. In \( F_{\text{ost-glob(mech)}} \) the context is the global musculo-skeletal structure and in \( F_{\text{ost-glob}} \) the capacity of a particular person (\( F_{\text{glob}} \)). It is possible that these two are essentially the same, the ability of the musculo-skeletal system to function being just one aspect of the ability of the whole person to function (as an effective agent). In this case the standard of good function for evaluating both \( F_{\text{ost-glob}} \) and \( F_{\text{ost-glob(mech)}} \) is not a nominal standard, as it is for \( F_{\text{phys}} \) but the ability of the patient to be an effective agent. However, this is a controversial point within osteopathy. The ‘Classical School’ of osteopathy, for example, drawing on Littlejohn’s teachings, claims there is a definitive proper mechanical structure associated with good health. The aim of the osteopath is to return the musculo-skeletal system to this ideal state, and the person to good health. This is assumed to be a natural law rather than a nominal categorisation. For the classicists, ‘structure governs function’ means that ideal
structural alignment (in accordance with the mechanical 'laws') results in ideal function of the person, which includes psychological and visceral function.83

The relationship between $F_{\text{glob}}$ and $F_{\text{pt}}$ is not the same as that between $F_{\text{phys}}$ and $F_{\text{biol}}$. $F_{\text{phys}}$ is a subcategory of, and not significantly different from, $F_{\text{biol}}$; what is physiological is also biological. However, I argued that $F_{\text{pt}}$ denotes a general perception of how someone should be able to function, while $F_{\text{glob}}$ is how they actually function. $F_{\text{glob}}$ is therefore not a subcategory of $F_{\text{pt}}$, rather $F_{\text{pt}}$ provides a standard for assessing $F_{\text{glob}}$; the two are judged to be the same when the person is able to do what they take-for-granted as their ability. So the same $F_{\text{glob}}$ can be judged to indicate illness in one person and not in another because $F_{\text{pt}}$ is different, due to different ages, expectations, pre-existing disabilities, or whatever. Conversely different values of $F_{\text{glob}}$ may all be judged to be normal function where $F_{\text{pt}}$ is different. This also makes explicit the value-judgements entailed by the ontological analysis and the lack of a fixed standard.

A consequence of the Classical School was for osteopaths, particularly in the middle part of the 20th Century, to 'lesion hunt', that is, to look for misalignments of vertebrae and other joints (according to the ideal model) and to correct them with manual techniques. Because this approach doesn’t require reference to a patient’s goals or need a case history, a competent practitioner, applying the appropriate ‘rules of thumb’, could assess and treat a patient from observation and palpation alone. This approach is closer to that of secondary than of primary care practitioners where there is no necessity to understand the illness as the whole experience of the patient; diagnosis and treatment can be performed by attending to local structures in the context of the total structure. On this account, $F_{\text{ost-glob(mech)}}$ entails a conceptual model of the ideal structure of a human being.

83 This may be different for each person in order to fit their particular morphology, age, etc. The difference is that it assumes that there is an ideal for every person, independent of agential requirements, which can be known from applying natural laws.
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naturally leading to normal function. This is no different from an engineer building a machine in accordance with the designer’s plans which, on the assumption that the design is good, will function well. Neither is it significantly different, as I will explore in 7.3.2.1, from the medical assumption that lack of pathology (including failed and malfunctions) means that the body is functioning normally and is therefore healthy.

Non-classicists, who today form the majority of practitioners, also base their clinical judgements of what is good function on the local response of tissues (considered in the next Section) in the context of the whole body, but more specifically on what is judged to be good for the patient in the context of their medical history and current life-style. Here, a patient’s history is important not just for clues to the presence of possible pathologies, but because it provides the context for understanding the significance of local tissue changes. It is not assumed that altered tissue states necessarily have a causal link to illness or health. The disposition of local tissue to have a particular capacity is distinct from any contribution it may make to functional or dysfunctional systems. In the Case Studies, the osteopath explicitly tells a story to describe the context in which local pathology explains the patient’s problem. Mrs A’s knee problem and occupational history are considered to be significant contributory factors in explaining the back trouble, even though the osteopath’s understanding of the local pathology of the low back is not significantly different from that of the orthopaedic surgeon or the physiotherapist. The context of the capacity of the whole person, $F_{\text{glob}}$, informs judgements about the rôle of local parts, $F_{\text{est-glob}}$. A variation of this is implicit in both the Classical and medical models, where an ideal total capacity, common to all Homo Sapiens, informs what is judged to be normal or abnormal capacity at a local level. The difference between the accounts is the difference between the ideal capacity, and $F_{\text{glob}}$, the actual global capacity of a particular patient. These in turn are based on assumptions of scientifically defined

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84 These judgements may require technical expertise in diagnosis and treatment. All I am cont ...
notions of $F_p$, or evaluative - socially, culturally and personally defined expectations - of human action, what can be taken for granted. On my evaluative model, function describes the relationship a local part has with the whole; its capacity to behave in taken-for-granted ways that enables the person to be an effective agent within any limitations imposed by $F_{glob}$.

I argue that function and dysfunction are relational concepts, not properties. Describing the function of a part (as the capacity of a system of dispositions) entails describing the relationship it has with the whole person (through a hierarchy of functional capacities) in terms of how it facilitates the agency of the person. A dysfunction, on this account, is a (dys)capacity that, operating in the context of the whole person, vitiates the person's agency. The challenge is to define the components of the (dys)capacity, i.e., the system that is relating dysfunctionally to the person as a whole.

Osteopaths explain patient problems explicitly in terms of dysfunction rather than disease, as a unique conflating of particular elements that may or may not include pathologies. This indicates a distinctive difference from conventional medicine whose practitioners focus primarily on correcting abnormalities through disease identification and assumes a scientifically determined or ideal for $F_p$. If $F_p$ is understood as a socially, culturally (and scientifically) derived evaluative notion with its focus on human action/agency - the ability to engage with the World in taken-for-granted ways - the explicit work of practitioners is to re-enable agency. This means focusing not on some ideal notion of human structure and function, but on producing a unique account of the patient and their problem in the context of taken-for-granted abilities, personal goals and expectations.

saying is that it is conceptually straightforward.
Osteopathy should be particularly insightful here because of the way it understands the musculo-skeletal system. I cited and critically reviewed Korr's claim that human life is lived through and valued for its musculo-skeletal activity – human life is first, a life of activities. We value being able to engage with and act on our environments. In particular, we express ourselves through activities – sport, recreation, dance, art – even emotions "move us"; in an important sense we are what we do. Our identity and sense of self-worth is linked to what we do. It is difficult to describe who we are without listing things we do or roles we perform. The particular ways that each of us engages with our world marks us out as lecturers, cabbies, mothers or gardeners. When those abilities are lost, some part of our identity is also lost. It is why unemployment or disability can be soul-destroying. The link between agency and the musculo-skeletal system is particularly explicit and osteopaths are ideally placed to appreciate how loss of ability to perform valued activities causes suffering. This cannot be appreciated fully unless local dysfunctions are analysed in the context of the whole person. The pain in my knee is significant because it vitiates my ability to do things I intend in a context where I take those things for granted; through the action of walking my knee is linked with my shoulder, the need for my heart to beat faster and so on. If illness is merely explained by the alien imposition of 'disease', much if not most of the meaning for a patient is ignored. It may therefore be possible for the 'disease' to be treated but the real cause of suffering – the loss of agency – to be missed, sometimes with dire consequences. The whole person failing to function ($F_{\text{glob}}$) is the context for interpreting local dysfunction ($F_{\text{ost-glob}}$) in terms of deviations from $F_{\text{phys}}$.

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It is probable that this explains heart-sink or fat-file patients. As an extreme example, Latey cites the case of a manual labourer in his 40s who presented to A&E with hysterical spasm of his right hand. It was removed "by forceful suggestion and persuasion". That evening he was brought back to the hospital after committing suicide. It later transpired that he had "for some months been becoming increasingly depressed, retarded and anxious: that his efficiency at work ... had decreased to a point at which he was in grave danger of losing his job and that this had further oppressed and worried him". (Latey, 1983)
Although I have said that this is probably a distinguishing feature of osteopathy, I would also argue that elements of it are implicit in the work of all, but especially primary care, practitioners. Because the medical model revolves around disease there is a failure to connect practice with theory. This, I pointed out, is evident in the GPs ambivalence about the significance of psychosocial factors in the Case Vignette. A clear requirement for all primary care practitioners is the need to engage in an ontological strategy to decide what constitutes the dysfunctional (dys)capacity. Osteopaths, more explicitly than conventional medical practitioners, use $F_{pt}$ to inform them which deviations of $F_{phys}$ if any, explain the patient's problem. From the presenting global picture of patient function ($F_{glob}$) and the particular (dys)capacity within $F_{glob}$ that is vitiating their agency ($F_{ost-glob}$) a particular problem can be explained. This involves two kinds of analysis; epistemological to judge which parts of, say the shoulder, are operating below normal capacity (nominally based on $F_{phys}$), and an ontological analysis to assess which body parts (and independent of whether or not they are functioning within normal limits) are contributing to the vitiating (dys)capacity that is the dysfunction. This distinguishes $F_{glob}$ as the global behaviour of the person, from $F_{ost-glob}$ the particular part of that behaviour that is of special interest to the osteopath.

So, to clarify the relationships between the various forms of function, $F_{pt}$ describes patient and practitioners' broad expectations of a person functioning in the context of their world; social and cultural interactions and expectations, plus physical engagement with the environment, including such things as occupation, recreation, domestic responsibilities, sports and so on. It represents an ideal capacity to the extent that this is what the person expects for themselves (informed partly from the same sources that informs practitioners about what is reasonable for patients to expect). However, by definition (because they are not ill), people functioning effectively on this global view have the necessary capacity to do what they take for granted and do not visit practitioners unless there is some other motivation e.g., a check-up for insurance purposes. People who visit practitioners are not able to do what they take for granted; $F_{glob}$ does not achieve $F_{pt}$. For a person who is not ill, $F_{glob}$ equals $F_{pt}$ but where functional capacity fails to achieve expected outcomes,
patients present in practice unable to do particular things they take for granted and functioning globally as $F_{\text{glob}}$. This global picture of the patient's overall (in)capacity may entail a number of different contributory factors including local pathological changes, adaptations to other or previous injuries or illnesses, specific adaptations related to morphology, occupation or recreation. It is the global picture of the patient $F_{\text{glob}}$ functioning in their "actual world" (to borrow Bhaskar's terminology (Bhaskar, 1978)) that provides the context for the osteopath to identify particular dysfunctional (dys)capacities, $F_{\text{ost-glob}}$. These are judged to be significant in explaining the patient's global incapacity. Knowledge of the (nominally agreed) capacity of local structures, contributes to judgements about whether the capacity in this case is within limits and perhaps contributing to global loss of agency. The important point is that neither operating nor failing to operate within normal limits necessarily leads to the clinical judgement that it is part of $F_{\text{ost-glob}}$ and, as we shall see, $F_{\text{med-glob}}$. It is here that context plays such a significant role.

This schema makes explicit an issue I raised earlier with reference to Fulford's "reverse view" of illness and disease. How reference to the function of an arm or leg is different from reference to the function of a person. Arms and legs can function in a variety of ways according to the intentions of the person, which makes them different from livers and hearts which have a limited, clearly defined, range of functions. I suggested that "action failure" alone is insufficient to define illness because although it implies, it doesn't make explicit, the context of an action. In the case of arms and legs the context is highly significant as the action of the arm in carrying a bag is different from its action in sawing a piece of wood, for example. Explaining loss of function in the arm requires knowledge of the intentions of the person (which is entailed by $F_{\text{pt}}$), knowledge of the global ability of this person ($F_{\text{glob}}$), knowledge of the normal physiological processes that explain the mechanical behaviour of the arm ($F_{\text{phys}}$) and finally an ontological analysis drawing on all of these, to explain the dysfunction (vitiating the person's agency) in this particular case ($F_{\text{ost-glob}}$). My analysis of function ascriptions in illness concluded that the context in which a trait operates is as important for understanding function as the effects of the behaviour.
My analysis now places the nominally agreed normal dispositions of body parts in the context of the global capacity of the person where the reference point is not just action but agency. Agency makes both the context and the intention of an action explicit.

$F_{ost-glob}$ in the context of $F_{glob}$ and $F_{pt}$ defines the fundamental osteopathic principle of the unity of the body, i.e., that everything in the body operates, and therefore needs to be considered in the context of the person intentionally acting in the environment and that the action of any part can only be properly understood in the context of its effect on the whole, the greater capacity. But not all body dispositions are relevant to all (lesser) capacities. The capacity that is necessary for walking is different from that required for singing or seeing. $F_{ost-glob(mech)}$ is mainly concerned to describe the capacities that enable physical activities and is therefore a sub-category of $F_{ost-glob}$.

7.3.1.3 $F_{ost-palp}$

Finally, and perhaps more controversially, osteopaths claim to be able to assess function from palpation, that is to feel the behaviour and activities of tissues in response to touch and movement, and from that information to make a judgement about good and bad function. As I explained in the Introduction, this is particularly explicit in Functional Technique, where diagnosis is based on the sense of 'ease' and 'bind' palpated in tissues. Bind is associated with dysfunctional states and is independent of pathology, i.e., it is not assumed that dysfunction, which may explain a patient's illness, is causally related to disease or pathology. However, it is implicit across the range of manual examination techniques. Joints are articulated and the quality of the end of range assessed, for example.

Ability to judge abnormal tissue states depends on practitioners having a referential standard of normal. This is different from $F_{phys}$ at least in practice, because of the difficulties of agreeing on what is palpated and the terminology for qualitative differences, but in principle is no different from having nominally agreed criteria of normal. Practitioners have their own criteria to which they work and which enables them to identify abnormal states. Inter and intra-observer reliability among osteopaths (and
manual therapists generally) is notoriously unreliable, nevertheless, osteopaths continue
to base a major part of their clinical judgement on palpatory findings. Statements such
as, "it feels better", or "it feels tight" and numerous other variations, are common in
osteopathic discourse.

This is a different kind of judgement from that of $F_{\text{ost-glob}}$ which, I argued, entails an
ontological strategy to judge which constituent parts explain a dysfunctional
(dys)capacity. Local qualitative changes to tissue, whether or not they are pathological,
are assessed through palpation in terms of response to manual stimulation, i.e., pressure
from the palpating digit or hand, from moving a joint, or from other forms of stimulation
such as tapping or stroking.

I have argued that judging function and dysfunction from palpation of tissue does not
necessarily infer the presence of pathology. What is felt may be described in terms either
of an abnormality of as 'inappropriate activity', by which is meant, the physiological
response is more or less than is judged appropriate to restore the homeostatic status quo.
This is what 'bind' describes in Functional Technique. As a joint is moved, the contiguous
soft tissues are palpated and their response to the movement monitored. Normally, soft
tissue will ease to accommodate the new position as a joint is moved. Binding, or rapid
increase in tension is taken as sign that the reflex mechanisms governing the movement of
the joint are dysfunctioning and causing an inappropriate response in the joint. (Whether
or not this is a contributory part of the patient's complaint is another judgement which
involves evaluating $F_{\text{ost-glob(mech)}}$.) Somatic dysfunction (briefly described in 1.4.2.2.1) is a
good example of deviation from normal physiological response which leads to illness.

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86 An unpublished undergraduate research project at the BSO (Hugel 2001) which looked at
palpation skills in osteopaths suggests that the ability to palpate, i.e., to feel differences in
what is palpated, is distinct from and runs ahead of the ability to verbalise what is found.
Subjects were asked to palpate letters formed from thick string and covered with layers of
tissue paper which were gradually reduced. It was noticed that they were able to identify
the letters by tracing the outline several layers of paper before they could say what the
letters were.
that is not actual pathology. On Korr's (1978) account of somatic dysfunction as spinal cord facilitation (or sensitisation), the dysfunctional (dys)capacity refers to the physiological effects of parts of the nervous system over-reacting and 'magnifying' the overall effects of neurones synapsing in that part of the spinal cord. Although, as previously discussed, the mechanism is disputed, there is general agreement that the palpated findings, comprising local tenderness, changes to the tissue texture, reduced mobility and so on, are clinically significant.

In addition to palpat ing these kinds of non-pathological states, osteopaths claim to identify pathologies. Inflammation, with its well-documented symptoms of heat, congestion and sensitivity in tissue, is perhaps the most common pathology to be diagnosed. Other conditions, including some cancers, are also linked to palpable changes in musculo-skeletal tissues. The rationale for this is that viscero-somatic reflexes reflect changes from internal organs and tissues onto somatic structures. It is not the place of this thesis to test the truth of these claims, merely to point out that osteopaths use palpation to detect changes that are interpreted as functional. My task is to analyse the theoretical framework that explains osteopathic work, the use of concepts and, specifically, how function terms are used.

What are osteopaths claiming when they feel for functional changes; are they palpating function or some effect from which function is inferred? I have argued that function is a relational concept, that is, it describes a particular kind of relationship between an item and the organism of which it is a part. Relationships are inferred from the behaviour of constituent parts; causation, for example, is not detectable empirically but inferred from constant conjunctions in empirical data. Osteopaths detecting functional changes in

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87 It can be argued that at a microscopic level, there are significant structural/pathological changes in the tissues. Whether or not this is true, the problem is that many tissues undergo such changes without necessarily contributing significantly to dysfunctional systems (i.e., they do not vitiate agency).
tissues around a joint in response to movement, say, are not feeling function as such, but changing structural relationships, which are taken as indicators of function. This is equivalent to a cardiologist monitoring the heart on an ECG machine, where electrical properties of the heart are interpreted as indicators of functional capacity. The claim by osteopaths that they can palpate the function of an area, as ease or bind say, is not strictly a claim to be able to palpate function, but to palpate particular (dys)capacities ($F_{\text{ost-glob}}$) associated with loss of agency.

$F_{\text{ost-palp}}$ is a factor that informs $F_{\text{ost-glob}}$ (another being $F_{\text{ost-phys}}$), and is, perhaps, no different in principle from analyses of function in conventional medicine such as active function tests.

7.3.1.4 "Structure governs function": what does it mean?

Finally, how are osteopaths to interpret the principle, "structure governs function"? As I noted in the Introduction, the problem is knowing what is meant, particularly by the terms "structure" and "governs". Either the phrase is a truism – all functions must take place in the context of some kind of structure – which means that it is not distinctive of osteopathy, or its meaning will depend on the circumstances in which it is used. The way it is interpreted also depends on whether we are trying to understand what Still might have meant originally or to analyse what modern osteopaths actually do. It is for historians to do the former; I made my task explicit when I stated that my interest is in examining the claims of osteopaths and conventional medical practitioners with respect to how they use function.

The meaning of "structure governs function" depends, first, on how structure is defined. If "structure" means anatomy or something like it, then the phrase is a truism but if it means something more complex and subtle, such as "the broader structural parameters of any given individual including morphology and individual adaptations to events", then it is describing the structural equivalent of $F_{\text{glob}}$, the structure of an individual. One of my key arguments is that function is not defined by structures per se, but by the agency of a person, their ability to act in ways they take for granted. Here, practitioners' judgements
about the function of structures such as arms, legs or livers, is informed from two sources, the agential need of the person to act in ways they take for granted, and from nominally agreed standards of normal for the parameters of physiological capacity in organs and tissues. But the phrase does not say "structure defines function", but structure governs and 'governs' can mean "sets the parameters of"; when something 'governs' it prescribes the limits within which certain (functional) activities can take place. In this case, it could be another way of describing $F_{ost-glob}$ which I have defined as a dysfunctional (dys)capacity constituted by a system of systemic dispositions. A structure on this reading, is a system with a specific functional capacity.

Analysis of $F_{ost-glob}$ suggests that various factors define the global context, $F_{glob}$. If structure means recognising that particular parts have clinical significance (to osteopaths) because they form a system, the capacity of which facilitates (in the case of function) or vitiates (in dysfunction) agency, then 'structure' will refer to body parts that are ontologically dependent within a system, i.e., acting together to produce a functional or dysfunctional (dys)capacity. So, to take the example of Mrs A from the Case Studies, the osteopath puts together a 'structure' consisting of her degenerative low back, plus her foot, knee and particular muscles in the thigh and pelvis. These are judged to act together as a system with a capacity that explains her presenting problem (illness). On this reading, 'structure' explains and 'governs' (sets the ontological boundaries to) the (dys)functional (dys)capacity of Mrs A. The driving question for osteopathic diagnosis is therefore, "what is the 'structure' that governs the dysfunction?" This may not be limited to physical structures. Part of the dysfunctional 'structure' may be psychological, or social – the person is acting in an inappropriate environment, e.g., living in an inner city high-rise flat, or is unemployed, etc. The structure of the 'dyscapacitous' system is defined by constitutive elements that together produce an effect that vitiates the patient's agency.

The role of context in making these judgements also becomes more explicit. Mrs A's knee is functionally significant because it is operating in the dysfunctional system that includes her spondylotic lumbar spine, (over)weight and contractured spinal muscles, the global
capacity of which manifests as back pain and stiffness. This is only significant because of
the context in which Mrs A lives, what she expects to be able to do. The 'structure', the
physical context within which dispositions/properties operate, therefore does "govern
function" and context is important not just at the global level of people acting in a
particular social context, say, but right down to the functions of hearts and livers. The
heart's function is governed by the structure/context in which its systemic dispositions
operate. This is not the same as the way the structure of a clock, say, governs its function
as a timepiece, though it might correspond in various ways. A better analogy would be to
consider the function of a tree in an ecological system. Here structure could refer only to
the 'tree' itself - roots, branches, leaves, etc, and the way it functions (as a tree); or to its
function in a particular situation. In a wood it may function as a habitat for birds and
insects, as a wind-break, or its roots may prevent soil erosion. The same is true for
management structures. If I am asked what my function is at the BSO, my answer
depends on which structure is being looked at.

I am not claiming that this is really what Still meant. I suspect Still had a narrower
mechanical understanding in mind; he had an engineering background and often
described the body in terms of levers, screws and wedges. Nevertheless, this mechanical
model is a legitimate way of 'structuring' the body. Here, then, the context for
understanding the function of local parts is a biomechanical structure. My argument is
that this is but one part of a broad way of conceptualising the structure and function of
the body and its constitutive parts.

If the meaning of structure is broadened in this way it takes it beyond the usual
assumption that structure is anatomy, and parallels my previous claim (derived from
Cummins) that function is not explained by physiology. Structure, on this account, refers
to the way parts act together to produce a particular outcome/capacity. Clearly the way
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this is done – what forms $F_{\text{glob}}$ – does not conform to some ‘proper’ natural structure that can be defined scientifically\(^{88}\), anymore than the ‘proper’ function of a plank, wheel or tree can be defined. This doesn’t mean that science has no part to play in the process; scientific investigation can verify the links between the dispositions of parts and the capacity of the system as well as the significance of the system in explaining the illness – the statistical significance of correlations between treatments to modify the capacity and the outcome of the illness, for example. Nevertheless, the judgement of what constitutes a dysfunctional system, is evaluative.

7.3.2. The concept of function in conventional medicine

Conventional medicine, through its focus on medical science, traditionally has emphasised $F_{\text{med-phys}}$. My analysis of medical practice suggests that, importantly but largely implicitly, primary care practitioners in particular are guided in their decision making by a global concept of the person, $F_{\text{glob}}$. How is this different from osteopathic practice?

I suggested that, like osteopaths, medical practitioners, in particular GPs, also take account of the way patients function in a global capacity. I cited Keith Thompson’s papers on illness and disease in the elderly as work that makes explicit the otherwise implicit assumption that what is important to patients (and practitioners) is not the presence of a disease \textit{per se}, but the loss of agency associated with the effects of disease.

More recently, as a further development of the Evidence Based Medicine (EBM) model of clinical practice, Context-Sensitive Medicine (CSM) has been proposed. (Sackett, Rosenberg, Gray, Haynes & Richardson, 1996) This takes specific account of the context

\(^{88}\) What it is that informs this process has yet to be analysed. It is beyond the scope of this thesis to extend my analysis that far, though I will be providing a few pointers to where I think the analysis needs to go in the concluding chapter.
of a disease and practitioners' (value-laden) clinical decision-making, which includes whether or not to take account of published evidence.

7.3.2.1 \( F_{\text{med-phys}} \)

As with osteopathy, conventional medicine uses a derivation of \( F_{\text{phys}} \) (\( F_{\text{med-phys}} \)) to define the normal behaviour of body parts. \( F_{\text{phys}} \) is based on (and often assumed to be identical with) \( F_{\text{biol}} \). \( F_{\text{med-phys}} \) like \( F_{\text{ost-phys}} \) is therefore closely related to \( F_{\text{biol}} \). I have argued that the uncritical application of \( F_{\text{biol}} \) to practice is problematic. \( F_{\text{biol}} \) whether or not it can be defined scientifically, is a scientific concept. Biologists want to know what the proper function of traits are in order to build a body of knowledge that explains all examples of a particular kind. Practitioners, conversely, want to explain this patient's illness by drawing from physiology's body of knowledge. \( F_{\text{med-phys}} \) like \( F_{\text{ost-phys}} \) provides a (nominal) standard against which practitioners can test the capacity of a particular part.\(^{89}\) The difference between the ways practitioners use \( F_{\text{med/ost-phys}} \) and scientists use \( F_{\text{biol/phys}} \) here is that practitioners are not confined by the outcome of a test; scientific judgements of whether a capacity falls within certain criteria and clinical judgements of what this means for the patient, are different.

It is likely that conventional medical practitioners place greater emphasis on \( F_{\text{phys}} \) relative to \( F_{\text{biol}} \) than do osteopaths. This is partly because osteopaths do not have as much access to scientific testing procedures as conventional practitioners do, but mainly it is because osteopaths place greater emphasis on palpatory findings and judgements of global capacity. A commonly heard claim is that every patient is unique and therefore cannot be categorised.

\(^{89}\) There is little real difference between \( F_{\text{phys}} \), \( F_{\text{ost-phys}} \) and \( F_{\text{med-phys}} \). The main difference is in the way that practitioners might modify the parameters of \( F_{\text{phys}} \) to take account of a patient's age, or environmental circumstances, for example.
I suggested earlier (7.2) that differences between primary and secondary care practitioners are just as significant as those between conventional medical practitioners and osteopaths. GPs, because their job requires them to explain patients' illness experiences presenting as loss of agency, necessarily have to take account of factors other than those of physiological efficacy, though they might explain the illness only in terms of physiology. Hospital doctors, on the other hand, because it is assumed that the patient has a legitimate medical problem, may focus exclusively on physiological criteria. In practice, as the Case Studies suggest, it is usual for both primary and secondary practitioners to use $F_{phys}$ and $F_{glob}$ to explain an illness though to different extents.

The greater reliance on $F_{phys}$ in secondary care is evident from the Case Studies where the orthopaedic surgeon has a list that he checks against standard criteria. This involves screening to find hidden abnormalities i.e., lesions not apparent from the presenting symptoms, but mainly it is to define the physiological capacity of the examined area. This means that the analysis has moved well beyond an (epistemological) Instantiation Strategy, focusing purely on the property of local parts, to an Analytical Strategy of functional capacity (on Cummins's account). Although conventional medical practitioners may place greater weight on the results of physiological testing, there is no significant difference between the way they and osteopaths conceptualise $F_{phys}$. Both involve systemic analysis, though conventional practitioners perhaps codify and categorise more than osteopaths do. Both $F_{ost-phys}$ and $F_{med-phys}$ can be replaced by $F_{phys}$.

7.3.2.2 $F_{med-glob}$

Does conventional medicine have an equivalent concept of local dysfunction in a global context? As Thompson's work makes explicit, at general practice level, much of a GP's work is linked to judgements of what is best for any particular patient. (Thompson, 1986; Thompson, 1992) In the Case Vignette the GP responds to Bill's wishes for a second opinion in order to carry on working. She is aware of Bill's medical history and of the psychosocial factors influencing his prognosis. Clearly there is some notion of $F_{glob}$.
informing clinical decisions, but is there an equivalent to the osteopathic F_{ost-glob} as local dysfunction?

Downie and Macnaughton, describe the rôle of anecdotes in consultations as the way in which patients explain their first visit to a practitioner. They recall how an older patient presented to one of the authors with a knee problem that was important to her because it affected her ability to play bowls. They go on:

This kind of patient anecdote is important because it reflects the individual's experience of the problem and gives the doctor a clear idea of how function is affected. For the patient, mild osteoarthritis of the knees was having a major impact on her lifestyle and merited physiotherapy and an orthopaedic surgeon's opinion. For another elderly woman, whose lifestyle was not so active, the condition might not have prompted any action. The anecdote reminds us that what the patient is interested in is their ability to function, not the severity or otherwise of the pathology. ... Patients want to be restored to normal function or at least to have an explanation for why they cannot function normally. (Downie & Macnaughton, 2000 pp. 57-8)

Explicitly in this account, conventional medicine clearly has a concept of F_{glob} that is distinct from F_{phys}. Dysfunction in knees can be measured against biostatistical (or whatever) standards, which may be the primary measure for orthopaedic surgeons who have to decide whether to operate or not, but of equal importance for GPs is how it is affecting the person's global ability to function. Evaluating this requires knowledge of the context in which the person acts which informs clinical decisions about treatment and management including referral, advice on lifestyle and so on. This kind of advice is no different from that someone would give if they were setting out to enhance the person's agency. The person's (physiological) capacity, their personal goals and intentions and the context in which they act, all inform the final decision. This is different from the approach of the orthopaedic surgeon in the Case Vignette, who saw context (in the form of
psychosocial factors) as something to be added onto the biomechanical rather than as an intrinsic part of the problem.\textsuperscript{90} This reflects the focus of secondary care practitioners rather than conventional medicine \textit{per se}. Even in this case the context of Bill’s history and situation is implicit in the clinical decisions and, if pressed, the orthopaedic surgeon might acknowledge that the desired outcome is to allow Bill to function (globally) and not merely to have his back fixed.

The issues I have described are debated in discussions about EBM where non-contextualised scientific information generalised from many examples, is applied to specific, i.e., highly contextualised, clinical situations. It is controversial because practitioners are asked to balance this kind of knowledge with knowledge drawn from their personal experience of the patient and similar illnesses that may not correlate with the published evidence. Although it is argued that EBM is not an excuse for “cook book” medicine (Sackett et al., 1996), it is not clear how practitioners should perform this balancing act. At the heart of the problem is the rôle context plays in clinical decisions. The best practitioners, as Downie and Macnaughton (2000) describe, perform the task intuitively, they keep up to date with the latest evidence but temper this with their experience and focus on the needs of the patient.

At one level this is a clearer process than the one I described for osteopaths. Diseases, conditions and syndromes take centre stage in conventional medicine. Osteopathy is much fuzzier with complex and untestable hypotheses generated to explain problems, but in principle they may not be very different. I argued that \textit{F_{ast-glob}} referred to specific dysfunctional (dys)capacities that explain (at least part of) patients’ global loss of agency and relies on knowledge of local (patho)physiological processes as well as a global

\textsuperscript{90} A recent \textit{BMJ} editorial recalls the editor asking ‘an orthopaedic surgeon how we could make the \textit{BMJ} more useful for him. “I’ve no idea,” he answered, “I never read it. You must understand that I’m only interested in elbows.”’ (Smith, 2001) The editorial goes on to plead for renewed interest in human caring and in patient centred practice.
understanding of the patient's goals and well-being. This is little different from conventional medical practitioners defining a range of dysfunctional (dys)capacities, terming them 'conditions', 'diseases' or 'syndromes', and then looking at how they affect patients globally. $F_{\text{med-glob}}$ may be less explicitly directed from the top, i.e., from the patient's sense of agency and taken-for-granted actions, but otherwise is similar to $F_{\text{ost-glob}}$.

$F_{\text{med-glob}}$ is an interesting concept due to the fact that although important in general practice where it is described in terms of psychosocial factors, it is largely implicit in diagnosis. Where psychosocial and other external factors are judged to be important they tend to be appended to biological diagnoses and therefore placed as a subcategory of $F_{\text{med-phys}}$. There is not the same notion of 'whole body' (as distinct from whole person) that is evident in osteopathic analyses of biomechanics. In other words instead of the gradual development of an increasingly complex system of dependent factors, starting from aggregations of cells into tissues, tissues into organs and body systems where each new picture incorporates all the constituent parts, conventional medical thinking tends to jump from one level to another. This means that the focus is on cells, or organs, or the whole person rather than, say, cells in the context of the whole person.

Interestingly, an on-line literature search on 'context sensitive medicine' mainly generated references to CAM and its relationship with conventional medicine. Which brings me finally to look at the implications my analysis has for future collaboration between the two professions.

7.4. Implications for collaboration between osteopathy and conventional medicine

A recent development in relations between CAM and conventional medicine has come about through the intervention of Prince Charles and followed a number of colloquia initiated by Sir James Watt between 1982-4. These brought together representatives from conventional and complementary medicine and resulted first in a report published by the Royal Society of Medicine (Watt, 1988) then the setting up of the Foundation for
Integrated Medicine (FIM). FIM’s aim is to bring together the best from a variety of practices but while the intentions of FIM are to be applauded, analysis of the published material reveals lack of clarity. These relate to two particular areas, what is fundamental (and beyond question) in practice, and how different traditions are to work together. Rees and Weil, in an editorial in the BMJ reveal both problems. They begin by defining integrated medicine:

Integrated medicine (or integrative medicine as it is referred to in the United States) is practising medicine in a way that selectively incorporates elements of CAM into comprehensive treatment plans alongside solidly orthodox methods of diagnosis and treatment. (Rees & Weil, 2001)

This says little about how the elements operate together; the embracing title is integrated (or integrative) medicine, but the article goes on to refer to “selectively [incorporating] elements of CAM into comprehensive treatment plans alongside solidly orthodox methods.” So is CAM to be “integrated”, “selectively incorporated”, or “run alongside” conventional medicine? These terms describe quite different kinds of relationship. Then there is the value-laden use of “solidly” to describe orthodox diagnosis and treatment. By “solidly orthodox” is presumably meant “based on scientific medicine”. Whatever it might presume, it infers that it is the best (or only) way to diagnose and treat, which begs the question why conventional medicine feels the need to add to something it considers is already solid and reliable. Perhaps it is recognition that medicine, despite its technical expertise, is lacking (or is perceived to lack) a necessary humanitarian touch which CAM practitioners have. If so, advocates of integrated medicine on conventional medicine’s side have failed to understand what CAM is saying about illness and disease – that illness is more than biological failure plus a few psychosocial factors.

Nevertheless, the fact that FIM has been established at all represents a sea change for medicine; it acknowledges that something important is missing from conventional practice. However it doesn’t yet offer an effective basis for true collaboration between professions. My position on this is that without recognising what the fundamental
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differences and similarities are, the potential for misunderstanding and suspicion will remain.

How might my work contribute to understanding? I have argued that function is a fundamental concept both in conventional medicine and in osteopathy, and that all practitioners' concepts of function are informed from two distinct sources, the biological notion of the proper function of individual parts, and the global notion of people functioning in a social capacity. Differences that arise between practitioners derive from different weightings and the explicit recognition given to these elements. Primary practitioners, including osteopaths, tend to focus more, and more explicitly, on $F_{glob}$ while secondary practitioners, including orthopaedic surgeons, focus more on $F_{phys}$.

What this means for practice is that there is a tendency for osteopathic diagnosis to take more account of $F_{glob}$ the particular goals a person has and the capacity they have to achieve those goals, while conventional medical diagnosis values $F_{phys}$ knowledge of the capacity of selected parts, an emphasis reflected in the appeal for "solidly orthodox diagnosis and treatment" in the quote above. The reason it is important to recognise these different emphases is because they involve different analytical strategies. Defining (dys)capacity $F_{ost-glob}$ in the context of $F_{glob}$ calls for what Cummins refers to as an Analytical Strategy, which, I have argued, involves generating an ontological account of (dys)capacity; while judging whether or not certain capacities fall within nominally agreed standards involves an Instantiation Strategy to determine what the properties are, but is primarily an epistemological exercise to justify how we can know whether a part is performing "in the way it should".

Differences in concepts of function between professions manifest therefore in the diagnostic process. Where $F_{ost-glob}$ and $F_{med-glob}$ are the primary foci (in the context of $F_{glob}$ and $F_{pt}$), diagnosis aims to explain illness behaviour, including biological behaviour, in the context of a patient's capacity to engage with the environment. On this analysis what counts as a successful outcome of treatment will be measured against effective agency; explicitly, the person's ability to act effectively in ways they normally take for granted.
whether or not constitutive parts are restored to 'normal' function. Where the primary focus of function is on the normal (or proper) behaviour of parts, diagnosis is described in terms of meeting or not meeting standards; treatment here attempts to restore standards and successful outcome will be measured not against any global effect on the person, but on the ability of parts to operate within normal limits.

Of course, as I have pointed out, few if any practitioners operate in only one of these modes. Osteopaths use information about local capacities, and conventional practitioners make decisions in the context of the whole person. Recognising different foci of function might limit possibilities for misunderstanding and suspicion between osteopaths and conventional medical practitioners and also between primary and secondary care practitioners.

The above might suggest that differences between osteopathy and conventional medicine are of degree only, but my analysis suggests that within these differences of degree there are important conceptual differences. If conventional medicine is strong on $F_{phys}$, osteopathy not only is strong on $F_{glob}$ but by making it more explicit has much to teach conventional medicine about the significance of activity and the role of context in clinical evaluation. The problem for osteopathy is that practice values are still implicit and practitioners continue to work from a folk-tradition.
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Chapter 8. Conclusions

I conclude that there are important differences in the way that function is conceptualised across and within disciplines and professions. The weightings given to \( F_{\text{phys}} \) and \( F_{\text{glob}} \) and the ways they (jointly) drive the diagnostic process, explain differences between primary and secondary practitioners and between osteopaths and conventional medical practitioners. Osteopathy has a special contribution to make from its explicit recognition of context in defining function all the way down from the global functioning of the person to the function of constitutive local parts. By identifying agency as the key to linking the role of context in the meaning of function statements to patients' intentions and self-perception, three elements that are important for (all) practitioners are made explicit: the context in which people and body parts act plus the structures formed by systemic relationships; the mental intentions of the agent and the way intentions provide a focus for action; finally, the extent to which the ability/capacity to act in ways that are taken-for-granted defines a person's perception of themselves as an agent, and informs judgements of whether or not they are ill.

8.1. Function: Whose interests does it serve?

The aim of this thesis has been to analyse the way function is used and understood by osteopaths in contrast to its use in conventional medicine (in the closely related area of orthopaedic surgery). An important conclusion is that there is no all-embracing definition of function that can be applied, other than in a very general way, to biology, clinical practice, sociology, artefacts, etc. The interests of biologists for example, in building a body of knowledge and a unifying theory of the living World, means that function focuses on defining standard outcomes and goals of biological behaviour. Sociologists and psychologists' interests in global human behaviour means that they understand function in terms of human relationships, goals and intentions. Artefact function is strongly defined by the intentions of the designer/craftsman. The specific interests of clinical practitioners in relation to function (explaining illness and intervening
therapeutically) have largely been ignored in the literature despite function being a fundamental concept for both theory and practice. My aim has been to clarify the uses of function, primarily in osteopathy, but also generally in clinical practice.

### 8.1.1. The importance of context in conceptualising function

The conventional medical assumption is that biological function can be applied unproblematically to explain illness through the "naturalisation cascade" (Fulford, 2000) of dysfunction and disease. This would make illness the logical consequence (conceptually and causally) of dysfunction and disease. My analysis of sample case studies and other literature, suggests that in practice, although clinicians use biological concepts of function to inform clinical decisions, this is supplemented (often covertly) by a broader more clearly evaluative concept of the individual functioning in a social/environmental context.

This might seem unsurprising; patients' experiences of illness entail more than biological failure, they take place in social contexts, which all the practitioners in the Studies acknowledge to varying degrees. The issue that I have addressed is how this context informs practice – does it merely modify biological (dys)function, or is it an integral part of the way function and dysfunction are conceptualised? My conclusion is that function at all levels, from the person 'functioning' in their physical and social environment to the local function of body parts, is contextual, and clinical decisions are informed by the way context is structured and understood.

I argue that an item's function cannot be known from analysis of properties alone, but from knowing (or assuming) the context in which those properties operate, and the emergent capacity. Function is therefore contextual and relational, i.e., it describes the relationship existing between an item and the system of which it is an ontological part. The heart only has a function in the context of the whole cardio-vascular system, even though its properties can (properly) be analysed in isolation. Biological concepts of function (as F_{phy},) therefore have a crucial rôle to play in informing clinicians about the
capacity of local parts, but these only have clinical significance where function is understood globally ($F_{\text{glob}}$).

In addition, primary care practitioners particularly, interpret patients' presentations of illness in a greater context ($F_p$). This, I argue, comes from patients' judgements that they are ill, which is informed by the loss (or threatened loss) of some ability (including the ease/comfort with which that ability is normally performed) that is taken-for-granted. I suggest that this includes, but is not fully covered by, Fulford's "action failure" (Fulford, 1989). I regard 'loss of agency' to better describe illness, as 'agency' makes the context in which an action occurs (and which defines whether or not an action is appropriate), and the agent's intentions in performing the action, more explicit.

This latter, more global focus on context, features prominently in the current literature, (see for example, Fulford, 1989, Nordenfelt 1995 as well as the phenomenological literature), but recognising the significance of context for understanding the function of local parts has generally received less attention. I argue that osteopaths' tendency to focus on dysfunction as a distinctive phenomenon in an individual begins to make the contextual significance for explaining local function more explicit.

8.1.2. Osteopathy's insights and the importance of musculo-skeletal function

I want to make one final claim, which has been implicit in much of my analysis, that the osteopathic focus on the musculo-skeletal system provides a conceptual bridge between $F_{\text{phys}}$ and $F_{\text{glob}}$. I cited Korr's perceptive comments that human life; "even the highest intellectual activity [is] lacking in value except insofar as it can be acted out, in and upon the environment and by being communicated to others." (Korr 1970) Block and Kissell describe a similar idea with respect to dance;

... dance embraces what it is to be an embodied subject, what it is to know the world and to express our own presence here in the only way human beings can. Dance captures
perfectly the physical universe in which we live and which we must spend our days mastering. (Block & Kissell, 2001)

To this can be added sport as the ultimate challenge of human physical ability. My criticism of Korr (among other things) was that he over-stated his case by implying that the musculo-skeletal system is more important physiologically than the visceral. But the musculo-skeletal system is conceptually more important to people because it is through activity that we engage with the world and express our human-ness, intentions and individuality - in terms of self-perception we are what we do. Not only that, our ordinary everyday activities entail the function of the whole musculo-skeletal system. As I described, picking up an object involves muscular activity in the legs and spine as much as in the arm. It is only by understanding the way local functional activity contributes to a person's agency (the intention to act in a particular context) that local dysfunction can be analysed and understood. Here osteopathy offers special insight; osteopathic evaluation and diagnosis emphasises the importance of the whole in understanding the significance of the part.

Osteopathy highlights two important elements, the one just mentioned - evaluating the significance of local dysfunctions in the context of $F_{\text{glob}}$ - and second, the way local dysfunctional systems ($F_{\text{ost-glob}}$) are identified, some of which come under the category of somatic dysfunction. This requires what I term an 'ontological strategy' to construct a coherent explanation for a global incapacity made up of a number of local (dys)capacities acting systemically. Both osteopaths and conventional medical practitioners already do this but mainly covertly and implicitly. Medical practitioners use a codified system of diseases and syndromes, while osteopaths work intuitively with dysfunction, but are often unable to explain their reasoning.

The musculo-skeletal system is therefore highly significant for understanding function because at the global end of its activity it enacts human activities - and is not (as some medical texts might infer) just a vehicle for transporting the brain and viscera - while at the micro-level it operates as muscle cells, collagen fibres and neuro-transmitters. Where
loss of agency is brought about by musculo-skeletal dysfunction, e.g., arthritic hip or PID, the link between local dysfunction and the loss of ability to act is straightforward. What my development of Cummins's analysis offers is a philosophical model for explaining how the dispositions of local parts combine in a multitude of ways to bring about the range of activities that give meaning and value to human existence, as well as explaining loss of agency.

The musculo-skeletal system also offers a model for conceptualising dysfunction in other body parts. If the functional capacity of a knee say, can only be fully understood in the broader context of how it facilitates or vitiates agency through its relationship to the hip, pelvis, spine and shoulder, the same also applies to other body parts. The pancreas, aorta and adrenal cortex can also be understood contextually, for dysfunctions in these structures are only significant when they result in loss of agency. It may be a different kind of loss of agency, "activity intolerance" (Waddell, 1997; Zusman, 1997) in back trouble (see footnote 57) is different from the sickness of pancreatitis or fatigue of ME, but they all result in loss of agency.

8.1.3. Further issues for osteopathy and conventional medicine

Conventional medicine, despite its economic importance, size and social status, is struggling to come to terms with its own technological success. This has changed the nature of medicine more fundamentally than is commonly recognised. I cited Mori (2000) who argues that the work of doctors today is not so much to aid nature in countering disease as to impart health through the manipulation of biological mechanisms. This has raised complex moral issues, including questions about what good health is, that cannot be answered scientifically. Science has served medicine well, producing new technologies, but this has produced its own problems related to what should be done, what good medicine is. This question requires detailed analytical examination of the fundamental issues relating to health and illness, and to the legitimate rôle of practitioners. Optimists in the past believed biology would give us that information, tell
us what is good, how things should be. It is now clear that it cannot and my analysis suggests that one of the reasons is because science cannot tell us how to conceptualise human behaviour. It can only inform us of the mechanisms that give it its capacity.

It is here that the concept of function is crucial. Biological definitions of function assume that traits have proper functions and that illness is the result of (is caused and logically explained by) failed function defined in terms of disease. If $F_{phys}$ is the only guide for practitioners, what should be done is a technical and not a moral question; but, in practice, practitioners don't rely on physiological judgements alone, but judge $F_{phys}$ in the context of $F_{glob}$. Practitioners do make judgements about what should be done in the context of what they (together with their patients) judge to be good in that situation.

This entails three kinds of judgement; first, judgements about how well something is operating, which comes from knowledge of mechanisms and biostatistically defined criteria for defining normal; second, moral judgements about human goods, what constitutes good human activity; finally, judgements about incapacity, the complex and unique ways in which properties (particularly, but not necessarily, those operating outside normal limits) combine to produce a (dys)capacity that explains a particular patient's loss of agency.

I am not suggesting that practitioners do not make these judgements; it is clear from the Case Studies that they do, but because they are not explicit, the judgements may not be as well informed as they could be, and the strategies for making them not well formulated.

### 8.2. Further analytical work required

A number of questions are raised by my study. I know that some of my colleagues will ask about the significance of my work for practice. I did not set out to change anyone's practice, merely to analyse osteopaths' claims and clarify how function is used in osteopathy. Nevertheless, emergent issues will require further exploration; the fact that osteopaths are unsure of their identity suggests that many are not confident with either their practice or its theory. If functional analysis is deemed central to osteopathy then it is
important that the way osteopaths understand and use function is disentangled from its medical homonym. This is not to argue for separation, far from it, but if osteopaths are to collaborate more effectively with medical practitioners, they must be conceptually clear about what it is they bring to the partnership.

What does my work mean for the way physiology and anatomy is understood and taught, particularly at undergraduate level. It will probably take time and much debate before the answer to that begins to emerge. Perhaps the more important question concerns the teaching of diagnosis. How does the concept of illness (as loss of agency), and dysfunction (as a (dys)capacity that vitiates agency), inform diagnosis? How does it affect the way psychosocial factors are incorporated into diagnostic explanations? There is still a tendency for osteopaths to diagnose medically, i.e., find disease, then fall back onto osteopathic evaluation. This assumes that medical diagnosis is scientific and “solidly orthodox” (Rees & Weil, 2001). Without understating the implications of particular signs and symptoms, my analysis demonstrates that the significance of all body events is contextual. In practice, cancers and muscle tears are considered in the same way, as dysfunctional states in a global context.

Although I argue that agency is the key to understanding function I have not spent much time analysing the concept of agency. My main focus has been on analysing function and the recognition that action/agency lies at its core. Questions therefore remain about the nature of agency. I argue that being an agent entails doing things we take for granted, but where does the sense of ‘taken-for-granted’ come from? Some of it is informed by science; understanding the properties of body parts leads to a clearer perception of what the physical limitations of the body are – though this perception may be wrong. Much may come from our engagement with other people and an intuitive (common) sense of what people do. Further analysis is required to begin to address these questions. Neither is it clear what kind of concept agency is. We have greater and lesser degrees of agency, our agency is constrained by different kinds of things – the physical environment, our expectations, our internal capacities – is there a threshold, as there is with pain (according
Part 4 – Implications for Practice

to the pain-gate theory), past which minor degrees of loss of agency accumulate to have a
major effect. This might explain the reason why people in social groups 4 and 5, where by
definition they have limited autonomy, suffer more illness than people in groups 1 and 2.
The final straw effect may apply to agency in the same way it applies to stress (Selye,
1976). The relation between agency and autonomy could prove an interesting one to
pursue. Autonomy is a central plank in bio-ethical theory; does agency imply or entail
autonomy?

If illness is loss of agency, function those behaviours and properties that facilitate agency,
and dysfunction those that vitiate it, then practitioners could clarify many of their
activities if they were more explicitly aware of and knew how to analyse a person’s
agency. There is insufficient space in this thesis to explore this, but broadly there is a
need to investigate what it is about agency loss that prompts someone to seek care and
how someone with permanent loss of capacity through blindness, absence of a limb or
some other disability say, evaluates their own health status. Does a loss of capacity
become part of what they take for granted, or do they continue to be informed by what
the majority of people take for granted?

A further consequence of my analysis is that practitioners may need to be clear about
what particular loss of agency a patient is suffering. The loss of agency brought about by
heart disease may be different from that of back pain. The fact that it is experienced and
described differently suggests that it is. Digestive problems make someone feel sick, back
pain makes them feel disabled (or intolerant of activity), mental problems lead to delusion
and so on. This will require more analysis of the experiences that prompt someone to
seek care and how to restore those capacities necessary for their full agency; it may also
lead to new ways of categorising illness. In the meantime, by making agency explicit,
practitioners can become more aware of what it is that makes someone classify
themselves as ill.

A question for biologists is whether my analysis has any relevance for understanding $F_{\text{biol}}$.
I argued that the literature defining function in terms of evolutionary theory and
biostatistical naturalism was unconvincing. A mistake of aetiologists and others defending an objective scientific understanding of function is to assume implicitly that items *have* functions. Biological items have properties but their functions involve relationships. I doubt whether this can be defined without value-judgements or inferences of teleology, yet the question cannot be side-stepped for function is a crucial concept in biology; it doesn't just describe *what* a part does, but its proper place in the organism.

Finally, I hope that my study has further clarified osteopathic work and demonstrated the relevance of osteopathic insights generally for all forms of clinical practice, but particularly in primary care. Primary care in the standardised medical model, has had a second-class status compared with the more high-tech area of secondary and tertiary care. This second-class status is reflected in the philosophical literature on function, which, as I have shown, has focussed particularly on function terms as used in physiology and other branches of biology. The primacy in my work of the function of the person as a whole, and the logical dependence of this on wider notions of context and agency, shows, by contrast, that the work of primary care practitioners whether in conventional or complementary medicine, in interpreting and explaining patients' illnesses is technically, psychologically and conceptually complex.
References &
Glossary of Function
Terms
Chapter 9. References


References & Glossary


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References & Glossary


Wolpert, L. (2000, 21st July). We’ve been thinking about moving for a very long time. The Independent, pp. 8.


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Chapter 10. Glossary of Function Terms & Notation

In the text I use a number of function terms to denote possible different uses of function ascriptions. The following table summarises what I mean by these.

<table>
<thead>
<tr>
<th>Function Term</th>
<th>What the term denotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>$F_{ost}$</td>
<td>Denotes the concept of function as used by osteopaths. I argue that this divides into four subcategories, $F_{ost-phys}$, $F_{ost-glob}$, $F_{ost-glob(mech)}$, &amp; $F_{palp}$, which represents different uses of function.</td>
</tr>
<tr>
<td>$F_{phys}$</td>
<td>Denotes the function of local body parts, e.g., the function of the liver, heart or retina. It is assumed to be a scientific concept (and therefore a category of $F_{glob}$) which sets referential standards for judging the capacity of these parts.</td>
</tr>
<tr>
<td>$F_{glob}$</td>
<td>Denotes the function of the body as a whole. This global capacity defines the ability of the whole person to act, though not their intentions or expectations.</td>
</tr>
<tr>
<td>$F_{ost-phys}$</td>
<td>Denotes the way osteopaths use conventional physiological concepts of function.</td>
</tr>
<tr>
<td>$F_{ost-glob}$</td>
<td>Denotes the way that osteopaths explain dysfunction in terms of (dys)capacitous systems in the context of $F_{glob}$. For example, a low back problem may be understood as the outcome of a (dys)capacitous system that includes the knee, hip and an occupation that necessitates standing.</td>
</tr>
<tr>
<td>$F_{ost-glob(mech)}$</td>
<td>Denotes a subcategory of $F_{ost-glob}$ that consists of the mechanical musculo-skeletal structures. It is conceptualised globally and local dysfunction identified in a global context.</td>
</tr>
<tr>
<td>$F_{ost-palp}$</td>
<td>Denotes osteopaths’ claims to assess the functional state of tissues through palpation.</td>
</tr>
<tr>
<td>$F_{med}$</td>
<td>Denotes the concept of function used by conventional medical practitioners. I argue that this is represented by two subcategories, $F_{med-phys}$ &amp; $F_{med-glob}$</td>
</tr>
<tr>
<td>Symbol</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>$F_{\text{med-phys}}$</td>
<td>Denotes the way conventional medical practitioners use conventional physiological concepts of function.</td>
</tr>
<tr>
<td>$F_{\text{med-glob}}$</td>
<td>Denotes the way conventional medical practitioners consider the overall ability of a person to function in an environmental context.</td>
</tr>
<tr>
<td>$F_{\text{pt}}$</td>
<td>Denotes the expected/assumed functional ability of an individual – taken-for-granted activities. Practitioners also have a perception of what can be taken-for-granted which may not correlate with the patient’s perception. It is this perception that sets expectations of agency and therefore loss of agency and illness.</td>
</tr>
<tr>
<td>$F_{\text{biol}}$</td>
<td>Denotes biological function.</td>
</tr>
<tr>
<td>$F_{\text{dis}}$</td>
<td>Denotes the way that function concepts inform the concept of disease. I argue that this is based mainly on $F_{\text{phys}}$.</td>
</tr>
<tr>
<td>$F_{\text{ill}}$</td>
<td>Denotes the way that function concepts inform the concept of illness. I argue that this is based on how well $F_{\text{glob}}$ is able to effect $F_{\text{pt}}$.</td>
</tr>
</tbody>
</table>

In the text I argue that these all finally reduce to $F_{\text{glob}}$, $F_{\text{pt}}$, and $F_{\text{biol}}$, where $F_{\text{glob}}$ is the actual global capacity of an individual and $F_{\text{pt}}$ represents the person’s expectation of what they should be able to do – those activities that are taken-for-granted. A person feels well when the capacity of $F_{\text{glob}}$ is sufficient to act according to the expectations of $F_{\text{pt}}$. 
The Concept of Function in Osteopathy and Conventional Medicine: A Comparative Study

Appendices

Stephen Tyreman

PhD Thesis
Appendix A – Empirical Study Case Reports

Mrs A

Orthopaedic Assessment (NM)

Presenting Complaint and History

Mrs A complained of low back pain of 11-12 years duration. The pain was cited in the lumbar sacral region and started gradually. She initially sought advice from her GP who performed an X-ray which was found to be normal. She was treated symptomatically.

4-5 years later her pain returned in the same site and she saw an osteopath in Amersham. After 4 sessions her pain improved.

Her back pain has been on and off and currently her pain is situated over the lumbar-sacral region and right sacroiliac joint. The pain is relieved by paracetamol and sitting in a reclining chair at 45°.

She has no morning stiffness, but her back is stiff after long walks.

She has no difficulty standing, sitting or walking. She has no other joints that hurt but her right knee has been painful in the past. Her weight and appetite is normal.

She has no psychosocial problems.

Past Medical History

Hypertension

Drug History

Moduretic

Social History

Ex-smoker (15 years)

Married, no children.

Occasional alcohol
On Examination

No evidence of jaundice, anaemia, cyanosis, clubbing or lymphadenopathy. Generally overweight.

Gait: Normal

Spine: No obvious scoliosis

Spine: Tender L5/S1 region and Right PSIS
  Flexion 6cm toe-touch, lateral flexion and extension some pain but full ROM
  No inappropriate signs.

Lower limbs: SLR, R=L 80° Hamstring tight
  Neurology normal
  Pulses normal

Abdomen: NAD

Impression

This 61 year old lady presents with a 12 year history of slowly progressive back pain. The features of the back pain suggest that it is mechanical back pain with no involvement of the spinal cord or spinal nerves. It is most likely to be due to facet joint degeneration in this age group.

Two symptoms of concern are the nocturnal pain which is a ‘red flag’ symptom that may suggest a more serious pathology and the pain relief at 45° which does not follow any obvious pattern of back pain. Regarding the nocturnal pain, this is unlikely to be anything sinister due to several factors: the prolonged duration and the lack of progression of the symptoms; the general well-being of the patient and no general features to suggest malignancy. Also the pain was not constant and was relieved by sitting at 45°. With regard to the pain relief at 45°, this may suggest an element of spinal stenosis with pain relief in spinal flexion and pain with spinal extension. There were no other features in the history to suggest that she has spinal stenosis such as neurogenic claudication.

In conclusion, this lady has back pain that is mechanical and most likely due to facet joint degeneration with perhaps an early element of spinal stenosis. To confirm this I
would like to see her lumbar spine X-rays and as a routine in this age group I would request blood tests to exclude any other spinal pathology.

Treatment

Assuming her blood tests and x-rays are normal, I would treat this lady with either physiotherapy or by an osteopath as I know that both these modalities are likely to improve her symptoms.

Physiotherapy Assessment (HS)

Current History

C/o constant pain over the lumbo-sacral area centrally that developed x 10 days ago with no history of any injury, strain or mechanical aggravating factor.

Previous History

She has suffered similar episodes over some 20 years which settle down with time but she has always been aware of some grumbling discomfort since that initial episode. She also complained of occasional episodes of discomfort felt into the right buttock and discomfort over the right greater trochanter if she lies on that side at night.

General Health

She has some BP problems and is prescribed moduretic and is on a self regulating weight loss programme believing herself to be overweight. She is moderately active and enjoys swimming but finds the facilities and their availability unappealing. She is currently awaiting an orthopaedic consultation for a left knee problem that manifested itself in July '97.

Occupational History

She retired six years ago from a job in charge of security at C&A's Oxford St store. She wonders whether the constant standing and meandering around her workplace aggravated her condition.
Pain Patterns and Modifying Factors

Sleep:-
Whilst she prefers to sleep on her right side she is unable to do so comfortably so finishes up on her left side. Currently she is woken up by her backache after 2-3 hours.

A.M., Day, Evening:-
There is no alteration in the pattern or intensity of her discomfort in relation to time.

Sitting, Sustained Flexion, Standing, Walking:-
If the back is sore she finds ease in sitting by leaning forward with her arms on a table. She finds a lot of difficulty in maintaining a flexed posture as in washing her hair, therefore now uses the shower for that purpose. She reports a limited tolerance to standing - perhaps up to 1 hour. Walking for about 2 hours or more will cause significant difficulties for her to bend afterwards - as in getting into a car for example.

Aggravates/Eases:-
Standing, walking distances, gardening, sustained forward flexion postures all will aggravate. Her back is eased by gentle activity, or using a reclining chair. She does not use medication for pain relief.

x-ray
An x-ray taken 12 years ago was reported to her as negative.

Expectation
She has no overwhelming problem but wants to ease the pains in her back. Whilst she feels that she will never be rid of all her pains she would like to have more ‘control’ over it.

Examination
Posture:
There is no scoliosis, lateral deviation or pelvic asymmetry but she does show a slight swayback with increased thoracic kyphosis and compensatory, cervical lordosis.

Movements:
Her spinal movements show a restricted pattern of mobility with flexion and extension provoking the target pain at end of range and side flexion movements showing very
little occurring at the lumbar segments. The right S.I. joint and hip showed a restricted pattern of movement whilst the left S.I. joint produced some pain when stressed.

**Palpation:**

Tenderness was most marked at the L5 segment centrally and progressively less so at L4 and L3. There was some evidence of soft tissue thickening paravertebrally left, associated with pain, over the L5 and L4 levels in particular.

**Neurodynamics:**

S.L.R. left was at 55°

S.L.R. right was at 60°

Neck flexion performed in sitting on the edge of the bed and adding trunk flexion reproduced the target pain at the lumbo-sacral junction - relieved by lifting the neck into extension whilst maintaining the slumped posture. There was no evidence of any nerve root compression.

**Aetiology:**

♦ Mrs A presents with a lumbar dysfunction that appears to have a degenerative base. It might be expected that if a current x-ray were available that it would show a degree of I.V. space reduction.

♦ The resulting increase in pressures acting on the facet joints have been accentuated by her posture in association with her weight distribution - her standing intolerance being significant in this regard.

♦ The lack of flexibility noted in the lumbar segments and the myofascial thickening over the left paravertebral structures has reduced her ability to absorb the energies of movements and mechanical stresses. Previous 'flares' of her symptoms leaving scar tissue from the micro trauma caused.

♦ There is also evidence to suggest some restriction of neural mobility which will undoubtedly contribute to her ongoing symptoms.

♦ The associated restrictions in the right SI joint and ilio-tibial band on the right have added to her vulnerability as well as producing local symptoms.
Treatment Plan

- To explain to the patient the probable cause of symptoms, set goals in conjunction with her and explain the treatment plan.
- Supple the affected lumbar spinal joint segmental restrictions.
- Release the myofascial tightness in the left paravertebral tissues.
- Mobilise the neural restriction.
- Re-educate postural control - dynamic and static

The above would be achieved physiotherapeutically by the use of manual mobilisation/manipulation techniques, myofascial release (trigger point release using manual or acupuncture methods or PNF methods), neurodynamic mobilisation, home exercise plan, advice and encouragement with regard to weight loss and a general increase in activity that would lead to greater fitness e.g. swimming or water based fitness and exercise groups.

Prognosis

There is every reason to expect that the current episode of pain will settle as they have in the past. The value of any intervention will be twofold.

1. To hasten the resolution of the current episode.
2. To give her control over her back means reducing her vulnerability. This should be possible if she can be diligent in the pursuit of her long term goals of maintaining back function by a combination of exercise and activity whilst respecting the need to minimise excessive stresses. This latter should not inhibit her in the use of her back but rather be achieved by adopting appropriate postures and using inherent stabilising mechanisms.

Osteopathic Assessment (ST)

Case Presentation Summary

61 year old retired shopworker (security). Presented with intermittent severe LBP and stiffness in the right more than left side. No sensory disturbance. Also complained of pain and swelling in the left knee.

First had problems 14 or 15 years ago. Was investigated at the time and had x-rays which were reported to be NAD. Patient has been aware of back problems since then,
though the severity varies. Had been particularly bad in the two weeks preceding consultation.

Condition aggravated by:

lying on the left side; bending forward. In bed it can wake patient after 2-3 hours. It is stiff after walking moderate distance.

Condition relieved by:

moving; using a reclining chair; on first going to bed.

Not significantly affected by:

warmth; coughing or sneezing.

Opinion

The symptoms are predominantly due to muscle ischaemia affecting the lumbar and thoraco lumbar erector spinae muscles, together with the tensor fascia lata bilaterally. The aetiology is multifactorial:

♦ The patient has severe pes planus which has resulted in eversion of both feet and a genu valgum deformity, plus a tendency to internally rotate both hips. These mechanical changes in the lower extremity have put strain on the lateral postural muscles; in particular the tibialis anterior and peroneus longus. The biomechanical changes in the hips are inhibiting normal flexion and extension in the course of which, additional strain is imposed on the gluteal muscles and through to the lumbo-sacral fascia effectively splinting the lumbo-sacral joint. Lumbar spinal mobility has therefore been focused on the mid and upper lumbar region. This situation will also account for the aching and swelling in the left knee.

♦ Spondylotic changes in the lumbar spine have resulted in reduced disc space and further restricted lumbar mobility. The poor range of movement in the lumbar spine has meant that local circulation is impaired both accelerating the degenerative process and embarrassing muscle function.

♦ The patient, although quite tall (5’ 9”) is carrying a considerable weight (15st 3lb). This is putting further strain on the postural spinal muscles causing fatigue and circulatory embarrassment

♦ A predisposing factor has been the patient’s former occupation as a security officer in a shop. This involved long periods of standing and slow walking, both of which
exercise the postural muscles of the spine, pelvis and lower extremity which have become hypertonic and contractured as a result. Slow sustained contraction fatigues skeletal muscle quickly. The loss of elasticity impairs local fluid flow and has contributed to the ischaemia.

Management Plan

My approach to this problem would involve identifying those factors that can easily be changed and those that cannot. I would therefore focus on improving muscle tone using soft-tissue massage together with deeper techniques to stretch connective tissue. The aims of both of these would be to permit easier flow of blood into and through the soft tissues. In particular the postural muscles of the pelvis are crucial in transmitting motion from the lower extremities to the trunk and in positioning the base of the spine. Lumbo-sacral joint mobility may be improved to some effect using articular techniques plus gentle manipulation.

I would also provide advice about not standing for long periods of time; to walk or swim regularly and generally to be moderate with activities. I think that losing weight, though desirable is unrealistic to expect. The patient’s weight is evenly distributed.

Finally, I would attempt to improve the muscle function in the lower leg, thigh and pelvis using massage and stretch techniques. This should allow more effective adaptation to the pes planus.

Patient Comments

*By letter to ST.*

“The questions I was asked about the pain in my back were more or less the same by all three gentlemen. Dr Makwana used the little hammer to check my reflexes more than Mr Tyreman. He measured my spine to check a difference between standing straight and bending down. He told me it was more or less wear and tear.

Mr Spencer’s examination was similar to Mr Tyreman’s, he was bending my legs, knees, feet and hips to check the movements of my joints. He asked me what I expected from my treatment.”
Mrs B

Orthopaedic Assessment (NM)

**Presenting Complaint and History**

Mrs B presented with a 1-2 year history of low back pain with frank thigh pain bilaterally. She injured her back in 1991 in a RTA in which she suffered a wedge compression fracture of L1. She has not seen anyone since then regarding this injury. Currently her back pain is worse than the thigh pain and she has no neurology of the lower limb.

For the last 18 months she has been a home care-worker which involves significant lifting. Prior to this she was a general care-worker. Her pain has been getting progressively worse and she has had some relief of pain with osteopathic treatment under the care of John Kelsey. This relief is temporary. Her pain is such that she is due to stop her current job on 7th November 1997. She occasionally has night pain but with no morning pain or stiffness.

She has some pain on standing and sitting, and walking is variable.

Her general health is good with no somatic symptoms and she is currently on a weight-reducing diet.

**Past Medical History**

1991: RTA, wedge fracture L1

**Drug History**

OCP; paracetamol

**Social History**

Recently married

**On Examination**

No evidence of jaundice, anaemia, cyanosis, clubbing, lymphadenopathy. Slightly overweight.

Gait: Normal

Spine: No deformity
Spine: Tender upper lumbar spine (L1) region and lumbar-sacral junction.
Some tenderness right PSIS and gluteal fold left.
Flexion 7 cm. Lateral flexion and rotation normal.
No inappropriate signs.
SI joint normal

Lower limbs: SLR, R=L 70° limited by tight hamstring
Neurology normal
Pulses normal
Hips normal

Abdomen: NAD

X-ray of lumbar spine and pelvis:
minimal wedge fracture otherwise NAD.

Impression
This 22 year old lady presents with a 1-2 year history of increasing low back pain with pain referred to her legs with no neurological symptoms. The features of the pain suggest that it is a mechanical type of pain not involving the spinal nerves. Her pain is probably a mixture of the old wedge fracture, muscular and possibly intervertebral disc related. There are no features to suggest a sinister pathology and there does not appear to be any increase in her wedge compression fracture to account for her upper lumbar pain. Her pain may be modified when she stops her present job and this may be all that is necessary.

Treatment
She would benefit from a programme of spinal mobility and muscle strengthening exercises under the care of a physiotherapist. If the symptoms do not respond to this after three months, further imaging studies may be required.

Physiotherapy Assessment (HS)

Current History
Mrs B complained of a constant ache that she describes at 5 on the visual analogue pain scale and which is felt at the lumbo-sacral junction spreading outwards across the top of both buttocks. She also gets an intense aching in the left thigh that is occasional
and in response to certain activities. This ache is felt throughout all aspects of the thigh, but does not extend beyond the knee. She feels that her symptoms are gradually getting worse.

**Previous History**

She relates a history of having been knocked off her bicycle in 1989 which resulted in a wedge fracture of a lumbar vertebra (which one) Her symptoms of back pain have been on and off since then but are now more constant and the leg reference referred to has only appeared this year.

**General Health**

She is generally well although probably overweight for her height; she is now in the process of losing weight having enrolled in a Slimming World programme.

She enjoys moderate exercise - jogs up to two miles and participates in an aerobic class where the teacher is alert to her back problem. Neither of the these activities provoke symptoms.

**Occupational History**

She is currently working in a Home Care environment but is due to change very shortly to an office job that will be mainly sedentary. She recounted an episode when controlling a stumbling patient gave her back significant pain and feels that this job has not helped the situation.

**Pain Patterns and Modifying Factors**

**Sleep**

Her sleep is disturbed, perhaps once a week and controlled by painkillers. Sleep has been much better since a new and more supportive bed was purchased. She prefers to sleep on her left side.

**A.M., Day Evening**

She can often feel stiff on rising, but this eases fairly quickly during the day and her symptoms are not influenced by time.
Sitting Sustained Flexion, Standing, Walking

Her tolerance to sitting for long periods is reduced with some difficulties transferring to being upright again. Similarly, she can react to periods of sustained forward bending. Her standing is limited to 1 hour tolerance and walking to 2 hours.

Aggravates/Eases

Riding a bicycle, lifting and carrying will aggravate her pain. It can be eased by stretches into extension.

She has no problems with coughing and sneezing.

She uses paracetamol, ibuprofen and warmth for pain control.

**X-ray**

Recent X-ray, but results not available for this report.

**Expectation**

Concerned at the increased symptoms this year and although she copes with them and they are not obviously stopping her from doing anything, there is an undercurrent of frustration.

**Examination**

**Posture**

She appeared to have a slight pelvic tilt with a raised right iliac crest. There was a scoliotic spinal curve convex to the left in the lumbar spine with compensatory curve in the thoracic spine.

**Movements**

*Extension* at 40% of expected range with deviation to the left and provocation of target pain.

*Flexion* to around 6 inches from the floor.

*Side Flexion Left* was restricted to around one inch above knee crease with the focus of restriction noticeable at the upper lumbar levels with target pain produced.

*Side Flexion Right* appeared normal range and painless.
S.I. Joints appeared to move comfortably and unrestricted.

Hip Joints - The right hip demonstrated a slight restriction in movement to a quick test and would need to be further evaluated.

Palpation

Somewhat difficult given the soft tissue bulk, but sensitivity to palpation was most marked at the L5 segmental level centrally and bilaterally progressively decreasing as we progressed up the spinal segments to ‘normal’ at around T10. The pattern suggested allodynia or super sensitivity of nociceptors.

Neurodynamics

S.L.R. bilaterally was limited to 45° but there was no evidence of neural compromise with reflexes, sensitivity to light touch and muscle strength normal. In high sitting neck flexion produced discomfort in the upper thoracic area. Adding trunk forward flexion brought the pain into the thoraco-lumbar area and adding either knee extension produced significant target pain which could be eased by adjusting the neck into extension.

Aetiology

♦ The mechanical restriction of the upper lumbar segmental movement - especially in to the left side flexion can probably be attributed to the consequences of the wedge fracture.

♦ The spinal postural deviation to the left is an expression of this stiffness although the appearance of a raised right ilium and its causes need to be confirmed.

♦ The widespread aching at the base of her spine spreading across into the top of both buttocks is probably more neurogenic in origin than mechanical given the hypersensitivity of the myofascial tissue allied to the undoubted restriction of neural mobility.

♦ The origins of the intense aching in the left leg are less clear, as I was unable to reproduce it, and the all encompassing distribution of the symptoms defies a dermatomal relationship. It is most likely that it is a neural reference when nociceptors are overloaded.

♦ It is of interest that she describes her pain level at 5/10 on the visual analogue pain scale and yet has coped with a physically moderately demanding job which is supported by her relative tolerance to standing and walking, aerobics and jogging.
Treatment Plan

1. To explain to the patient the probable cause of symptoms, set goals in conjunction with her and explain the treatment plan.

2. Supple the mechanical segmental restriction at the upper lumbar level by manual mobilisation/mobilisation.

3. Mobilise the restricted neural components both centrally and peripherally.

4. Treat symptomatically to reduce the allodynia by the use of acupuncture, electrotherapy.

5. Consolidate the above by:
   i) Postural re-education
   ii) Exercise programme to:
       a) mobilise mechanical, neural structures
       b) strengthen and recruit supportive muscle.

6. Once steps 1 - 5 have been achieved, to integrate into function by progressing her generalised fitness programme, e.g., cycling, aerobics, etc.

7. Within the context of the above continuing assessment of the Signs, Symptoms and particular reference to assessing the right hip and pelvic asymmetry as noted and to monitor the pattern, distribution and characteristics of the left thigh pain.

Prognosis

If the neural restriction can be mobilised there should be a significant reduction in the level of allodynia.

She has had symptoms for eight years which always tempers the optimism of predicting a successful outcome.

I find a discrepancy in the level of constant pain that she reports and the fact that she is largely unaffected mechanically in her daily activities. This makes me less certain about predicting the outcome.

Osteopathic Assessment (ST)

Case Presentation Summary

22 year old Home Care Assistant (also does some dog grooming). Presented with bilateral LBP and an aching pain down the lateral aspect of her left leg as far as the knee. There were no sensory disturbances.
In 1989 (age 14) she had been knocked off her bike by a car in a RTA. She hit the windscreen and incurred a wedge fracture at L1. Since then she has had problems with her back. She had physiotherapy exercises prescribed but they didn’t improve the problem. The symptoms have gradually been getting more frequent and more severe, possibly aggravated by “pulling” her back when taking the weight of a patient in her care. She has had some treatment from a bonesetter which helps for about a day afterwards.

**Condition aggravated by:**

- flexion (particularly prolonged semiflexion) of the trunk, cycling and lifting.  
The patient suffers leg cramps and the low back stiffness in the morning can be so severe that the back “locks”

**Condition relieved by:**

- a firm mattress and warmth.

She suffered a hyperextension injury to her neck from an accident bell-ringing, which was treated by the bone-setter, but otherwise has no significant medical history.

**Opinion**

This patient has a poorly compensated spinal curve with excessive muscular activity when trying to maintain a standing posture. This is centred on the upper lumbar spinal level where the intervertebral segments are reduced in mobility and the paraspinal soft-tissues are hypertonic almost to the point of spasm. They are also extremely reactive to palpation. The resulting scoliosis is concave to the right in the thoracic and upper lumbar spine with rotation causing a ‘high’ side on the left thorax. The pelvis is shifted sideways to the right.

The thoracic kyphosis extends down into the mid-lumbar spine through a local flexion group at the thoraco-lumbar junction. This presumably is the result of the old injury and wedge fracture at L1.

Although the fracture itself has healed, the soft-tissue changes have not resolved and the resulting chronic state is not functioning fully. This area of the spine is biomechanically significant in that it marks the normal transition from the lumbar lordosis to the thoracic kyphosis and is also the area where most trunk rotation occurs.
Management Plan

My main aim in management would be to improve muscle function through gentle soft-tissue massage. At the moment the chronic fatigued state of the muscles is both responsible for many of the symptoms and also masking the underlying tissue state. Once the muscles are functioning efficiently it should be possible to assess the postural biomechanical changes more accurately and evaluate how the body is trying to compensate and adapt.

It was noticeable that the posture and biomechanical relationships altered during the time of the examination. After lying down, the spine was straighter, but in the course of a few minutes reverted to the pattern described above suggesting that muscle fatigue is a significant factor in the problem.

Ultimately the ideal would be to improve the mobility and functioning of the thoraco-lumbar area. This should be possible, though the chronic state of the tissues would indicate that this might take some time and would require quite a lot of treatment to bring about the necessary long-term changes.
Mrs C

Orthopaedic Assessment (NM)

Presenting Complaint and History

Mrs C reported a 20 year history of recurrent episodes of back pain which began in her 20’s. Her first severe episode occurred in her mid 20’s when she had low back pain whilst she was working full time. She sought help from an osteopath and after 3-4 sessions her pain improved significantly. To maintain the pain relief, she continued with swimming and keep-fit exercises which kept her pain under control. Her second episode occurred 9 years later with severe low back pain in which she was seized with pain. She saw her GP who treated her by bed rest and analgesia for 4 days after which she began to mobilise. Her pain settled gradually and since then she has had intermittent episodes. During this time she has had no time off work.

Her back pain is mainly lumbar-sacral and more right sided. She describes the pain as a dull ache which occasionally is sharp. The pain is aggravated by standing, ironing, driving and lifting, and in particular if she is in any one position for any length of time. Her pain is relieved by rest, and lying flat. Analgesics have no effect. She also gets morning stiffness occasionally with no other joints involved. Sitting or standing aggravates her pain particularly if in any one position for a long time. Walking in unlimited but she does walk with pain.

She also described a pain in her right thigh over the anterolateral aspect which she described as a toothache with no pins and needles or numbness in that limb. This is a recent problem she thinks may be related to her back.

She has no psychosocial problems.

Past Medical History
BCC excised right shoulder

Drug History
Nil

Social History
Doesn’t smoke

Occasional alcohol
3 children: no epidural

**On Examination**

Generally fit. No evidence of jaundice, anaemia, cyanosis, clubbing or lymphadenopathy. Slim.

Gait: Normal

Upper limbs: Psoriasis of elbows

Spine: No scoliosis

Spine: Tender C-spine - mild general full ROM
      L-spine tender L5/S1 region and right PSIS
      Flexion 5 cm toe-touch; lateral flexion to left increases pain, normal range; lateral flexion to right no increase in pain.

Lower limbs: SLR, R=L 85° SST Hamstring tight
      Neurology normal
      Meralgia Paraesthetica right thigh Tinel+
      Pulses normal

Abdomen: NAD

No inappropriate signs.

**Impression**

Mrs C gives a 20 year history of recurrent episodes of back pain. The back pain is usually relieved by resting after which she is able to mobilise again. The history suggests that she has mechanical back pain with features that may represent discogenic type of back pain. The pattern of her episodes and with periods of pain free intervals suggest that it is unlikely to be anything more pathological. However, she does have psoriasis which can be related to arthropathy but this is unlikely as it rarely involves the spine initially before other joints or before other systemic features. Her symptoms do not suggest nerve root entrapment and her examination did not have any features of this. She does have features of meralgia paraesthetica of the lateral cutaneous nerve of the thigh. To confirm this, a local anaesthetic around the nerve would be diagnostic and therapeutic. If unsuccessful, surgery may be required. This is not related to her back pain.
In conclusion: Mrs C gives a 20 year history of back pain which is most likely to be mechanical due to degeneration of the disc. As she has had pain for 20 years I would like to see plain X-rays of the lumbar spine to exclude other causes.

**Treatment**

I would treat this lady with physiotherapy to re-educate her on back care including advice on lifting safely, especially as her job may involve heavy lifting. Physiotherapy may also tone the muscles in her back to prevent postures that may aggravate her pain.

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**Physiotherapy Assessment (HS)**

**Current History**

Complained of constant aching across the base of her back with intermittent aching into the right buttock extending postero-laterally into the right thigh to the mid thigh level. She rated her pain at 4.5 on the Visual Analogue Pain Scale. The backache has been present on and off since the birth of her children now aged 7, 8 & 11, but has become much more constant in recent months with the leg reference appearing around six months ago and gradually developing in severity. It is this latter development that has triggered her determination to do something about it.

**Previous History**

She recalls an episode of back pain 15 years ago when she visited an osteopath and a similar episode 10 years ago which settled within 3-4 days with bed rest. She has suffered intermittently since.

**General Health**

She reports having had an ovarian cyst removed - the abdominal scar is noted. She enjoys swimming, has ambitions to cycling and has a skiing holiday in prospect which is giving her some concern. She feels that she is less ‘fit’ than she should be.

**Occupational History**

She is a teacher working with those with learning disabilities and is community based which involves her in a lot of driving.
Pain Patterns and Modifying Factors

Sleep:-
She is undisturbed at night

A.M., Day, Evening:-
Initially feeling aching and stiffness this will fade within half an hour of rising. Aching tends to increase with the day and is at its worst in the evening.

Sitting, Sustained Flexion, Standing, Walking:-
She gets an increase in her aching with time spent sitting and becomes quite fidgety, constantly adjusting her posture. She is then aware of some discomfort in transferring to standing for which she describes a 15 minute tolerance only. Walking will also aggravate her back, but she is more tolerant of walking than standing.

Aggravates/Eases:-
- Sitting in the care or at home for extended periods and standing for periods of beyond 15 minutes will aggravate her symptoms which will also be accentuated by lifting or carrying.
- She is eased by half lying with her feet up. She does not take any pain medication at present.
- There was no pain on coughing/sneezing.

x-ray

Lumbar Spine: “Spondylotic changes at several levels, fairly minimal - some disc space narrowing - particularly posteriorly at L3/4, L4/5 - more marked at L5/S1.” - August 1997

Expectation

She mentioned two problems that concern her:

1. She is having difficulties lifting her youngest child.
2. She recognises that the constant aching is affecting her, both physically and emotionally and, therefore, those around her.
Examination

Posture

She stands with the right iliac crest raised compared to the left which is reflected in a lumbar spinal deviation to the left and thoracic deviation right. The posture is maintained when sitting too!

Movements

A restricted range of lumbar spinal movements is evident with extension at 50% of expected range, flexion at 35cm fingertips to floor and side bending left and right 3 and 4 finger breadths from the knee crease indicating a significant degree of restriction.

She demonstrated a mild restriction of her right hip, but the SI joints appeared not to contribute to symptoms. She demonstrated a poor quality of stabilising muscle control when asked to tension abdominal (transversus) and deep back muscles (multifidus).

Palpation:

Palpation revealed tenderness over the L4 and L5 segments on the right side in particular.

Neurodynamics:

S.L.R. was at 80° bilaterally with reflexes, sensory perception and muscle strength normal. Neck flexion plus trunk forward bending produced the target back pain which was increased by adding right knee extension but not left knee extension.

Aetiology

♦ She has a history of memorable episodes of back pain from at least 15 years ago which, given current x-ray evidence would suggest that she probably suffered some disc substance injuries. The effect of three pregnancies and subsequent abdominal surgery will have weakened the supportive/stabilising muscles of the abdominal wall and perhaps the pelvic floor.

♦ The cycle of repetitive minor trauma over the years in the presence of relative instability has obliged her to withdraw from physical activities for fear of further damaging her back creating the conditions which make the spine actually more vulnerable.

♦ Trespass into the neural canal has restricted mobility of elements of the right sciatic nerve albeit fairly subtle at present.
The postural deviation adopted in both standing and sitting would suggest an antalgic posture maintained by hyperactivity in the lateral flexors of the spine - the ilio-costalis and quadratus lumborum muscles on the right. These structures have probably now adaptively shortened causing lengthening and weakness of their opposites.

**Treatment Plan**

- To explain to the patient the probable causes of the symptoms, set goals and explain the treatment plan.
- To address the immediate pain issue by use of mechanical and electro-therapeutic anti-inflammatory measures concentrating on the paravertebral focus of the myo-fascial tissue irritability.
- To assess the pelvic tilt to better determine the causative and maintaining factors, i.e. leg length discrepancy, muscle spasm, adaptive shortening of myo-fascial structures, ilium rotation, etc.
- To supple the restricted lumbar spinal segments.
- To explore and mobilise the neural restriction.
- To correct the muscle imbalances evident and yet to be discovered (? the hip restriction).
- To develop a long term strategy so that she can return to uninhibited activity and to maintain maximal function.

The above will be achieved by combinations of manual mobilisation/manipulation, neural mobilising techniques, myo-fascial stretching, muscle balance exercising both isometrically and dynamically and complemented by electrotherapy modalities where appropriate.

**Prognosis**

It would be reasonable to expect to be able to restore a painless and functional spinal unit although this in large measure would depend on the patient’s determination to accept the obligation that I would place on her to fulfil her role in the treatment. This would require her to be dogged in the performance of her exercise routines and their application in functional and dynamic situation.
There is little doubt that she will suffer future episodes of backache, but their frequency, severity and duration will be significantly diminished if she can be diligent in maintaining her back fitness programme.

Osteopathic Assessment (ST)

Case Presentation Summary

41 year old lady who works part-time with adults with learning difficulties. She presented with “niggly”, persistent LBP mainly on the right side. She also had aching into her left thigh. There were no sensory disturbances.

The problems first started about 14 years ago when LBP developed gradually for NAR. At the time she had some osteopathic treatment which helped for a while. 11 years ago there was a severe episode of LBP precipitated by reaching over to put her baby (eldest of three) into a cot. This gradually eased with rest and she had no additional treatment. However there had been niggles in the back on and off ever since.

Six months before presenting, she started getting pain into the lateral aspect of her right thigh. She had an x-ray from her GP which showed “spondylotic changes [in the lumbar spine] at various levels - fairly minimal - some disc narrowing particularly posteriorly at L3/4, L4/5 - more marked at L5/S1.”

Condition aggravated by:

- sitting in a car; standing still doing activities like ironing; movement after period of rest; gardening; it is very achy at the end of the day.

Condition relieved by:

- lying flat; sitting supported in a comfortable chair; warmth.

There was no other relevant medical history.

Opinion

Standing examination revealed a significantly short lower extremity on the left accompanied by a scoliotic spinal curve concave to the right in the lumbar and lower thoracic spine and to the left in the upper thoracic. There was a high side on the right side of the thorax, indicating rotation to the right. The cervical spine fails to bring the
head back to the midline causing the head to be held side-bending to the left and with quite a lot of muscular contraction in the neck and at the cervico-thoracic junction. On bending forward, there was a strong tendency for the whole trunk to deviate to the right.

This problem appears to be the result of a breakdown in the body's attempt to compensate for a primary short lower extremity on the left side. There is muscle hypertonia and fibrotic changes at the lower lumbar levels particularly on the right side in the erector spinae, and also in the tensor fascia lata and gluteal muscles. The hypertonic state of the lumbar soft-tissues is preventing the posterior tissues of the spine from relaxing adequately when flexing causing the sidebending to the right and is also restricting sidebending to the left - against the natural curve.

Although there is evidence of degenerative changes in the lumbar spine, these are relatively minimal and are probably not contributing significantly to the overall state other than by limiting the range of movement that is theoretically possible. Of much more significance is the state of the soft tissues for which there is evidence of fatigue and ischaemic muscle pain.

**Management Plan**

There are two obvious approaches to this problem; the first is to reduce the effect of the short leg by prescribing a heel lift; the other is to improve the way in which the body is compensating for and adapting to the imbalance. I would take the latter course as the preferable option for two reasons; the first is that the hassle of fitting heel lifts to all shoes and remembering to use them is problematic for most people. Despite good intentions, once symptoms are improved, the heel lift gets forgotten. Also, imposing a heel lift can further unbalance the situation if the muscles are not in a sufficiently healthy condition to adapt to the new mechanical requirements. Persuading the body to adapt to the ongoing situation will mean attention to particular limitations within the body structure, for example the restricted mobility at the lumbo-sacral joint due to the spondylosis and the developed organic scoliosis, but it will also mean considering how the patient is using her body at work and in domestic and leisure activities. Assuming that I consider that the health of the tissues can be improved sufficiently to accommodate to both these factors that is the management approach I will adopt.
Appendices

Patient Comments

*Given to NM following the examination and reported by him*

Mrs C felt that ST’s history was very similar to NM’s in that it was methodical and systematic. She felt that ST focused more on her neck pain and headaches which NM did not. She also felt that ST examined her back more thoroughly for scoliosis which was different from NM’s examination. Otherwise she felt the examination was similar and felt that both completed a full neurological examination.

Overall she did not feel there was a significant difference between the two examinations.

*By letter from Mrs C addressed to ST, dated 14/11/97.*

“As you are aware I was examined by yourself [ST] and Mr. Makwana. The type of question asked were very similar, perhaps Mr Makwana’s were more concise in content.

The examination in part was also similar, i.e., examination of reflexes, bending, lifting and the examination of the lower back.

However, your examination was more detailed. You appeared interested in the alignment of my body, and other areas of possible discomfort. I remember you asked about neck pain and headaches.

I also recall your interest in how it all started and probable causes.

Mr Makwana’s examination appeared more specific and brisk. He also ended with a diagnosis.”
Appendix B - Published paper

Back pain that threatens livelihood

Bill Marshall is a 50-year-old foundryman who presents in the surgery with an episode of back pain. From his medical record you note that this is his fourth episode in five years, and that all previous occurrences have resulted in several weeks off work before he was fit to return to his job. Today, he complains of low back pain without radiation and with no neurological signs.

Bill is worried that he may be off sick for several weeks, and will lose his job as several colleagues are currently under notice of redundancy. At his age, he feels he will not be able to get another job and, as his wife is partially disabled, they will have financial difficulties. He asks you to refer him to a specialist and an osteopath to speed his recovery.

How would you manage this request, and what advice would you give both Mr Marshall and his employer who requests your advice on prognosis?

Our first response comes from Dr Tonia Myers, GP:

I have a lot of sympathy for Bill's request. It is far more straightforward to look after someone like Bill, who wants to work, than someone who I suspect just wants sick notes.

From the history and examination, it seems that he is suffering from simple mechanical back pain, but before I can decide about management and referral I need to know more about the previous episodes. What precipitates the pain? What does Bill do when he gets the pain and what treatment and investigations has he had?

Bill should have had my usual chat about 'back care'. I check that patients know how to lift correctly and that they have firm mattresses, and I advise them about good posture. In the acute phase I recommend a brief period of bed rest and simple analgesia, followed by early mobilisation. Bill may have had physiotherapy in the past, but often patients get better before the appointment comes through!

As this is the fourth episode, he will probably have had a lumbar spine X-ray. Although this is usually normal or simply shows degenerative changes, it can be useful as a baseline and seems to give psychological benefit to some patients.

I doubt whether a specialist will have much to add to Bill's management. An orthopaedic surgeon is unlikely to order any special investigations and the waiting time for a new referral locally is at least six months. If, on discussion, Bill still wants the reassurance of a second opinion, it is reasonable to refer him in view of the recurrent nature of his pain.

Options for referral

The referral letter should contain Bill's social history so that the consultant understands the reason for seeing him. Sometimes patients ask for a private referral, but Bill is unlikely to have private insurance and he would probably be better off spending his money on physiotherapy or, if he prefers, osteopathy.

These days a request to see an osteopath is not problematic because osteopathy is no longer considered to be 'alternative'. For people with uncomplicated back pain and no neurological signs it often speeds recovery, and it can be useful as a baseline and seems to give psychological benefit to some patients.

Tonia Myers  MB BS  MRC GP  DCH  FRCP DRCOG  GP, Highams Park, London
Stephen Tyerman  MA  DO  MRCP  Osteopath, Lincoln and Head of Concepts and Philosophy Department, British School of Osteopathy, London
Alan Gardner  MB BS  FRCS  Consultant Orthopaedic Surgeon, Hartswood Hospital, Brentwood and Springfield Medical Centre, Chelmsford
How I treat...

may help Bill to get back to work sooner.

I would explain that it is not my policy to recommend a specific osteopath, but that he can self-refer. There is a list of such practitioners registered with the General Council and Register of Osteopaths in the Yellow Pages. Often, osteopaths do not have the relevant clinical information available to them, so I would give Bill a brief medical report to take with him.

I can reassure Bill that his prognosis is good. Between episodes he appears to have made a full recovery and he is likely to do so again. I will advise him about prevention but, if the pain is brought on by heavy lifting at work it may well recur in the future.

I would be happy to write a report along these lines for Bill’s employers if he gives his written consent. But however much I want to help Bill, I can only give them the facts and ultimately they will decide his fate.

Next, Mr Stephen Tyreman, Osteopath, has the following comments:

**THERE ARE FOUR STAGES IN DEVELOPING AN OSTEOPATHIC MANAGEMENT PLAN FOR THIS PATIENT:**

- **Investigating the underlying pathology**
  
  It is probable that the case history would indicate that this episode is the latest stage in an ongoing mechanical problem. To investigate it, I would rely on observation and palpation supported by other evidence, such as that from X-rays or MRI scans.

**Biomechanical relationships are important considerations**

I would be looking for abnormal patterns of movement, which might indicate strains, restriction or local reactions such as spasm. In a low back pain problem, the biomechanical relationships of the pelvis and legs to the lumbar spine are important aetiological considerations. Therefore, although the symptoms may occur in the low back, the source of the problem might be found in more remote areas (including internal organs).

I would gain key information from palpation – arguably an osteopath’s most important skill. The texture and response of tissues to touch reflects their health and functional capability. This is a qualitative rather than quantitative evaluation, but is particularly helpful in localising dysfunction and establishing appropriate treatment.

- **Assessing postural and other ergonomic factors**

  Occupational factors, perhaps repetitive movements or the adoption of a particular posture, can lead to musculoskeletal changes. While this may not result in symptoms, it can reduce their ability to function appropriately in response to additional demands. It is likely that something of this kind would be found in Mr Marshall.

- **Considering psychological and other background stress factors**

  The first two stages lead to a mechanical/postural picture of the structures causing pain or disrupting mechanical efficiency.

  This picture now has to be placed within Mr Marshall’s history and environmental circumstances – in particular, worries about redundancy and finances. Such factors are potent causes of muscle hyper tonia and neural sensitisation.

- **Developing short-term and long-term management plans**

  The short-term plan would be to alleviate the immediate symptoms by a combination of soft tissue massage, joint articulation and other gentle, manipulative techniques. Mr Marshall is likely to need one or two half-hour sessions each week for up to four weeks.

  In the longer term, I would aim to reduce the effect of predisposing factors. In addition to manual treatment, this would involve regular back exercises, advice about lifting and lifting aids (especially regarding helping his wife), and stress management.

  I would try to ensure that Bill understands exactly why he developed back pain. I would encourage him to become more aware of how his back responds when he works, sits, worries and so on. Greater awareness would lead to more control and better compliance with treatment.

  Finally, much could be gained from attendance at a Back School if there was one in the local hospital.

  A letter of acknowledgement, in addition to a summary of my findings and suggested treatment plan, would be sent to Mr Marshall’s GP together with a request for copies of any test results or other relevant information that may have come to light since the referral.
Finally, Consultant Orthopaedic Surgeon Mr Alan Gardner explains his approach:

A consultant with a major interest in managing spinal disorders, I would have received clinical information on Bill’s back problem via a referral letter from his GP.

Having reached this stage, the burning questions are:

- How can the present attack be terminated quickly?
- How can future attacks be prevented?
- What is the long-term prognosis?

We cannot begin to answer any of these questions unless we have a reasonably accurate working diagnosis. Fortunately, unless surgery is contemplated, it is only necessary to assign Bill to one of four diagnostic groups:

- Myofascial or non-neural or non-radicular pain
- Radicular pain involving the nerve roots or cauda equina
- A mixture of both
- Pain associated with a radiological abnormality such as spondylolisthesis, tumour or infection.

We should also note that strong psychosocial factors often influence the amount of distress and disability that back pain causes. Studies show that excessive distress as a manifestation of emotional disturbance and the pursuit of compensation have a powerful adverse effect on recovery from back pain: obese, very tall or very short patients, smokers, alcoholics and heavy manual workers all have a raised incidence of back pain. Those with boring jobs and unfulfilling lifestyles also take longer to recover.

It is likely and desirable that Mr Marshall will have previously seen a physiotherapist, osteopath or chiropractor. Hopefully, his GP will have been able to guide him to a competent member of one of these professions who can usually help in speeding the resolution of acute attacks. They may also help to some extent in prevention through postural training, back strengthening exercises and daily living advice such as avoiding uncomfortable car seats, a sagging bed and damaging activities at work.

Bill Marshall has a recurrent history of acute episodes of back pain over five years. His back pain/leg pain ratio is 100 per cent back, indicating myofascial non-radicular pain with no neurological involvement.

It is likely that Mr Marshall is well motivated by worries about losing his job and also the need to look after his dependent wife, and that he has a genuine organic complaint. The clinical examination may be quite quick and would need to be directed towards determining the exact location of any tenderness he experiences.

At this stage it is possible to give Mr Marshall a reasonably clear idea as to what is going on in his back and this is a very important therapeutic step.

If he has predominantly midline pain and tenderness the likely diagnosis is lumbar instability syndrome, and it can be explained that he has one or more slightly flat tyurs in his low back. Like slippage hinges, these degenerate discs are mechanically inefficient and now and again allow abnormal sheering movements causing intense protective muscle spasm.

In recognising this picture, he will, no doubt be glad that it is not unusual and that he is not going to be paralysed, be seriously disabled long term or end up in a wheelchair. Indeed, he can be told that most patients with lumbar instability syndrome tend to stabilise around the age of 60 as their disc degeneration runs its full course.

Although he will have some backache, he can probably look to a reasonably...
How I treat...

Most patients can be managed by the reassurance of a satisfactory diagnosis and treatment with 2 or 3 days bedrest then gradual mobilisation with the help of a physiotherapist, osteopath or chiropractor.

Mr Alan Gardiner

comfortable retirement including a moderate amount of gardening and so on.

If, on the other hand, Mr Marshall's pain and tenderness is lateral to the midline, he probably has one of the soft tissue syndromes. Assuming he remains symptomatic, I would inject some local anaesthetic and steroid (10ml of 0.5 per cent lignocaine plus 1ml of Depot-Medrone or similar preparation) into the tender tissues.

Two times out of three this will relieve the present symptoms, although he may be worse for a day or two after the injection. The injection may need to be repeated after four to six weeks and may reduce frequency of recurrences. In fact, this injection acts in much the same way as for tennis elbow and the lesion is presumably very similar.

As for treatment of lumbar instability syndrome, having given Mr Marshall an explanation of his condition, his options are:

• Conservative management with a course of back strengthening exercises and a weightlifter's belt to wear at work, which would probably be helpful to support his back. Simple painkillers or anti-inflammatory medication can be taken when necessary. He should be able to contact a physiotherapist, osteopath or chiropractor if he has an acute recurrence of back pain lasting more than a few days.

• An epidural injection of local anaesthetic and steroid may help if he develops more chronic low back pain, but the effect of this is likely to be temporary.

• Surgery is an option but is unlikely to be helpful in Mr Marshall's case as he would probably lose his job. If, however, none of the above alternatives proves satisfactory and he does lose his job because of a continuing deterioration of his back so that he is no longer able to look after his wife, surgery may have to be considered to restore him to a reasonable quality of life.

Resorting to major procedures

It has to be said that although surgery for nerve root compression and spinal stenosis has a reasonable level of success, surgery for back pain alone is much more controversial.

MRI scanning and, in some cases, provocative discography have greatly improved our ability to diagnose the precise source of pain. If this is localised to one or perhaps two segments and is convincingly demonstrated, perhaps spinal fusion can be considered. However, this is a major procedure that requires about six months of rehabilitation and is generally not to be recommended unless carried out by a specialist spinal surgeon.

Even then the success rate is around 60 per cent in degenerative disc disease, although it reaches 80 to 90 per cent for spondylolisthesis.

It is perhaps worth mentioning that over the last five years flexible stabilisation using bilateral pedicle screws and fabric bands has been gaining ground. It was developed by Dr Henry Graf of Lyon in the late 1980s and the results are probably superior to those of spinal fusion. The surgery is less severe, does not involve bone grafting, and rehabilitation takes half as long.

Most patients in Bill's situation can be satisfactorily managed by reassurance of a satisfactory diagnosis and a realistic prognosis and treatment with a combination of a day or two's bedrest at the most, then gradual mobilisation with the help of a competent physiotherapist, osteopath or chiropractor, combined with simple analgesia and/or non-steroidal if necessary.

A light lumbosacral support or weightlifter's belt will help to protect his back at work and perhaps some modification of his work activities or movement to a lighter job, if at all possible, should be considered.

Bill's prognosis will depend to some extent on his response to this treatment. If his response is prompt and satisfactory he could probably continue in his present job for a year or two, but it would certainly be wise to move towards light work that did not involve prolonged sitting or standing in one position, or repeated bending or lifting. Storekeeping, warehouse work or light van driving is usually suitable.

If his response to simple treatment is poor and if he cannot quickly be transferred to lighter work, it is likely he will have to retire on health grounds. If his condition continues to deteriorate further, investigation and even surgery may be considered.

Further reading

